COVIDIEN

Service Manual

Valleylab™ FT10

FT Series Energy Platform

Service Manual

Valleylab™ FT10

FT Series Energy Platform

For use with software version 2.0x

Part Number: PT00047922

Preface

This manual and the equipment it describes are for use only by qualified medical professionals trained in the particular technique and surgical procedure to be performed. It is intended as a guide for servicing the Covidien Valleylab FT10 FT Series Energy Platform only. Additional user information is available in the *Valleylab FT10 FT Energy Platform User's Guide*.

Equipment covered in this manual
Valleylab FT10 FT Series Energy Platform (VLFT10GEN) with software version 2.0x

The latest version of the VLFT10GEN user's guide and service manual is available at http://www.medtronic.com/covidien/support/biomed-connect/electrosurgery.

Call these numbers to request a hardcopy of the service manual

- USA and Canada: 1 800 255 8522 Option 2
- International: 1 303 476 7996

Additional technical information may be available from Covidien Technical Service (see page 10-6).

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Chapter 1

Overview and General Features

This chapter provides an overview of the features and functions of the Valleylab FT10 FT Series Energy Platform.

Precaution

Read the instructions, warnings, and precautions provided with this energy platform and associated accessories before using. Specific instructions for electrosurgical instruments are not included in this manual.

The Valleylab FT10 Energy Platform

Introduction

The Valleylab FT10 FT Series Energy Platform (VLFT10GEN) provides RF energy for monopolar and bipolar surgical applications, and tissue-fusion and vessel-sealing applications. It features a touchscreen divided into four quadrants for viewing and user input of settings and options available for any application. The energy platform automatically detects coded handsets and configures the energy platform accordingly. Safety and diagnostic functionality include automatic fail-safe functions.

The VLFT10GEN, applied parts (patient return electrodes and active instruments) are designed to work as a system. Covidien offers a selection of patient return electrodes and active instruments that are fully compatible with this energy platform.

- Refer to each instrument's instructions for use (IFU) for indications, warnings, and specific contraindications.
- When considering other manufacturers' patient return electrodes and/or active instruments, customers should seek detailed user instructions and warning information from the manufacturer.

The generator is intended for use in general surgery and such surgical specialties as urologic, vascular, thoracic, plastic, gynecologic, reconstructive, and colorectal surgery.

Indications for Use

The VLFT10GEN is a high frequency electrosurgical generator intended for use with monopolar and bipolar accessories for cutting and coagulating tissue. When used with compatible sealing devices, it is indicated for sealing vessels up to and including 7mm, tissue bundles, and lymphatics.

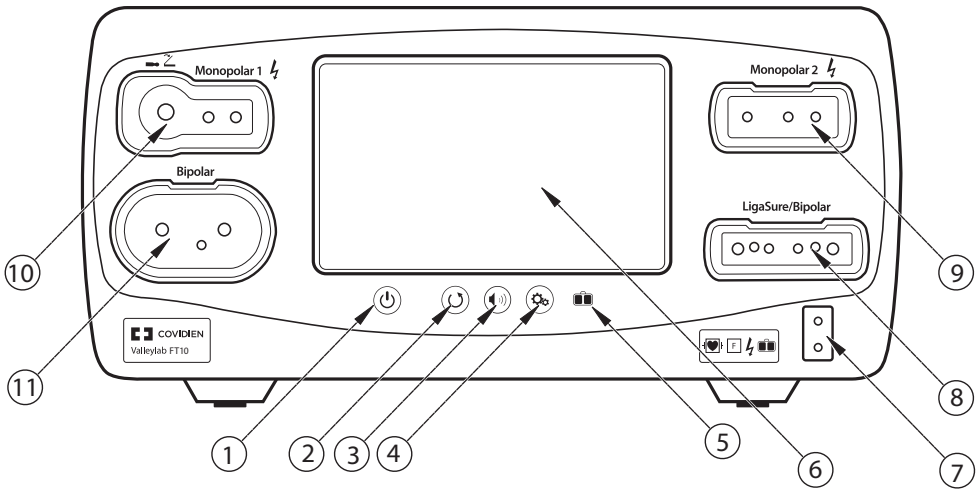
The generator can also be used with compatible resectoscopes for endoscopically controlled removal or coagulation of tissue using 0.9% NaCl solution as the irrigation medium.

The tissue fusion function has not been shown to be effective for tubal sterilization or tubal coagulation for sterilization procedures. Do not use this function for these procedures.

Contraindications

None known.

Front Panel



① On/Off button

② Restore Settings button

③ Audio Volume control button

④ Service/Settings button

⑤ REM™ (Return Electrode Monitoring) indicator

⑥ Interface touchscreen

⑦ REM patient return electrode receptacle

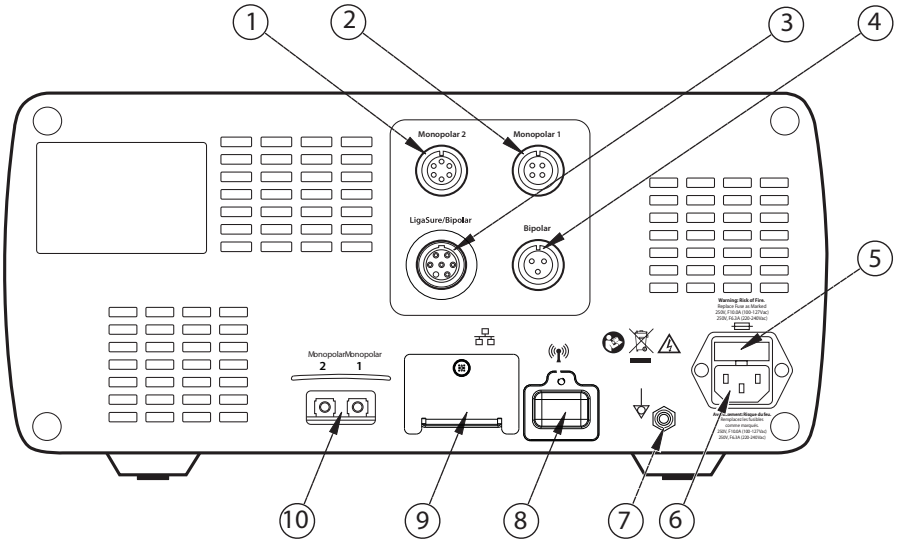
⑧ LigaSure™/Bipolar receptacle

⑨ Monopolar 2 instrument receptacle

⑩ Monopolar 1 Universal Foot-Pedal Port (UFP) receptacle

⑪ Bipolar instrument receptacle

Rear Panel



① Monopolar 2 foot-pedal receptacle (requires included adapter to connect standard four-pin monopolar foot pedal)

② Monopolar 1 foot-pedal receptacle

③ LigaSure/Bipolar foot-pedal receptacle (requires included adapter to connect bipolar resection foot pedal)

④ Bipolar foot-pedal receptacle

⑤ Fuse drawer

⑥ Power cord receptacle

⑦ Equipotential ground connection

⑧ WiFi antenna (Covered. For service only.)

⑨ Ethernet receptacle (Covered. For service only.)

⑩ Interlink cable receptacles for EKG blanking and smoke-evacuation control (independently linked to Monopolar 1 and Monopolar 2 activation)

Modes & Settings

The VLFT10GEN provides the following modes and settings for a variety of surgical procedures:

Monopolar modes	Power-Setting Ranges	Peak Voltage
· CUT		
- PURE	Off, 1–300 W	1287 V
- BLEND	Off, 1–200 W	2178 V
· VALLEYLAB	5–60 W	2783 V
· COAG		
- SOFT	Off, 1–120 W	264 V
- FULGURATE	Off, 1–120 W	3448 V
-SHARED FULGURATE	Off, 1–120 W	3448 V
- SPRAY	Off, 1–120 W	3932 V
- SHARED SPRAY	Off, 1–120 W	3932 V
Bipolar effects		
· LOW	Off, 1–15 W	133 V
· MEDIUM	16–40 W	214 V
· HIGH	45–95 W	462 V
LigaSure (tissue fusion)	No power settings	244 V
Bipolar Resection effect		
· CUT	1–6	742 V
· COAG	1–6	318 V

Monopolar Modes

The system produces six modes of monopolar power output.

Precaution

To provide expected functionality from a hand piece, proper insertion is required. Refer to the alignments dots below the receptacles for proper insertion orientation.

CUT Modes

PURE CUT provides a clean, precise cut in any tissue with little or no hemostasis.

BLEND CUT is a conventional blended waveform that provides slower cutting with simultaneous hemostasis.

VALLEYLAB Mode

VALLEYLAB mode is a unique combination of hemostasis and dissection that allows the user to slow down for more hemostasis and speed up for faster dissection.

COAG Modes

SOFT desiccates tissue at a relatively slower rate with deeper thermal penetration. It is typically performed with a ball electrode.

FULGURATE coagulates tissue by sparking from the active electrode, through air, to the patient tissue.

SPRAY delivers wider fulguration; penetration is shallower and the affected tissue area is larger than with the FULGURATE mode.

SHARED allows two monopolar instruments to activate simultaneously in either FULGURATE or SPRAY modes. A single power setting is provided and power is shared between the two instruments.

Note: SOFT and SHARED COAG modes are features that are not available on the clinical screen until they have been enabled. These features can be enabled through the Feature Enabling menu of the service screen. See *Feature Enabling Menu* on page 3-10.

Compatible Monopolar Instruments & Devices

The following Covidien catalog numbers for monopolar surgical instruments, return electrodes, foot pedals, and adapters are fully compatible with the VLFT10GEN.

Monopolar UFP Instruments (connect only to Monopolar 1)

E05021 Monopolar Adapter
E050212 Monopolar Adapter

The Monopolar 1 UFP-receptacle, identified by a blue ring, accepts UFP connectors with diameters of 4 mm to 8 mm, and lengths of 15.2 mm to 41.7 mm. UFP connectors with a diameter of less than 4 mm require an adapter to connect to the Monopolar 1 UFP receptacle.

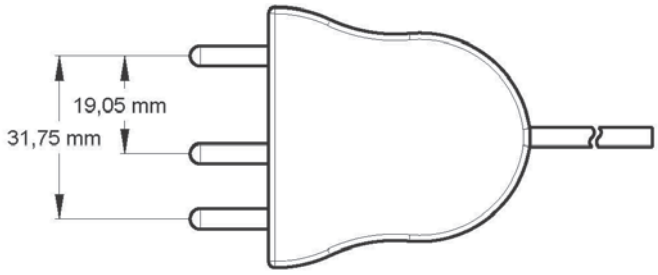
Monopolar Instruments (connect only to Monopolar 2 receptacle)

FT3000DB Force TriVerse™ Electrosurgical Device
FT3000 Force TriVerse Electrosurgical Device

Monopolar Instruments (connect to either Monopolar 1 or Monopolar 2)

This generator is designed for use with Covidien monopolar instruments. However, other monopolar instruments are compatible with the VLFT10GEN if they have a connector that matches the following figure and are rated for peak voltages of at least 3932 V.

Monopolar



Utilizes 4 mm banana pins

Return Electrodes (Monitoring)

E0560 Valleylab REM Patient Return Electrode Cord
E7507 REM Polyhesive™ Adult Patient Return Electrode
E7507DB REM Polyhesive Adult Patient Return Electrode
E7508 REM Polyhesive Adult Cordless Patient Return Electrode
E7509 REM Polyhesive Adult Cordless Patient Return Electrode
E7509B REM Polyhesive Adult Cordless Patient Return Electrode
E7510-25 REM Polyhesive Infant Patient Return Electrode
E7510-25DB REM Polyhesive Infant Patient Return Electrode
E7512 REM Polyhesive Neonatal Patient Return Electrode

Return Electrodes (Non-Monitoring, for use in DEMO mode only. Not for clinical use.)

E7506 Non-REM Polyhesive Patient Return Electrode

REM Connector

E0507B Valleylab Multiple Return/S Cord Adapter

Foot Pedals

FT6003 ForceTriad Three-Pedal Footswitch (Monopolar 2 only)
E6008 Valleylab Monopolar Footswitch (Monopolar 1, Monopolar 2 with adapter)
E6008B Valleylab Monopolar Footswitch (Monopolar 1, Monopolar 2 with adapter)
1017577 6-Pin to 4-Pin Monopolar Footswitch Adapter (Monopolar 2 only)

Bipolar Effects

Selection of bipolar effects and power settings is dependent on surgeon preferences, tissue characteristics, accessories selection, and the intended clinical application.

LOW effect is for power selections of 1–15 watts. It delivers low-voltage output for precision and fine control of the amount of desiccation typically used with small-surface area instruments.

MEDIUM effect is for power selections of 16–40 watts. It is a conventional bipolar output typically used with medium-surface area electrodes.

HIGH effect is for power selections of 45–95 watts. Power remains constant over a wide range of tissue types and may be used for large electrodes.

Effect Setting	Power Setting Range	Optimized Instrumentation
LOW	1—15 watts	• Small-surface area instruments • Micro-tip forceps (0.4—2.2 mm)
MEDIUM	16—40 watts	• Medium-surface area instruments • Micro-tip forceps (1.0—2.2 mm) • Small paddle lap forceps • Bipolar scissors
HIGH	45—95 watts (5 watt increments)	• Large-surface area instruments • Large paddle lap forceps

Auto Bipolar

The Auto Bipolar feature senses tissue impedance between the two bipolar electrodes, then uses the impedance information to automatically start or stop bipolar RF energy delivery. Optionally, the user may select a timed activation delay for auto start of RF activation.

Note: When using Auto Bipolar, the tissue in the grasp of the bipolar device must have an impedance less than 2200 Ω. The activation impedance safety feature will not deliver RF power to the tissue if it is not within the specified range. This is a factory-set value that cannot be reset by the user.

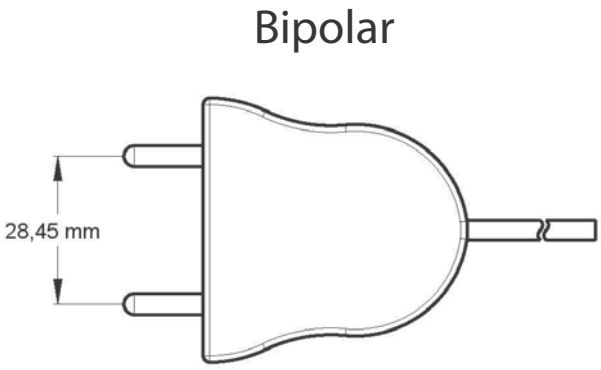
Note: Auto Bipolar is a feature that is not available on the clinical screen until it is enabled. This feature can be enabled through the Feature Enabling Menu of the service screen. See *Feature Enabling Menu* on page 3-10.

Important
If the VLFT10ADP1 Bipolar Adapter is used, only one bipolar instrument can set the Auto Bipolar feature to ON.

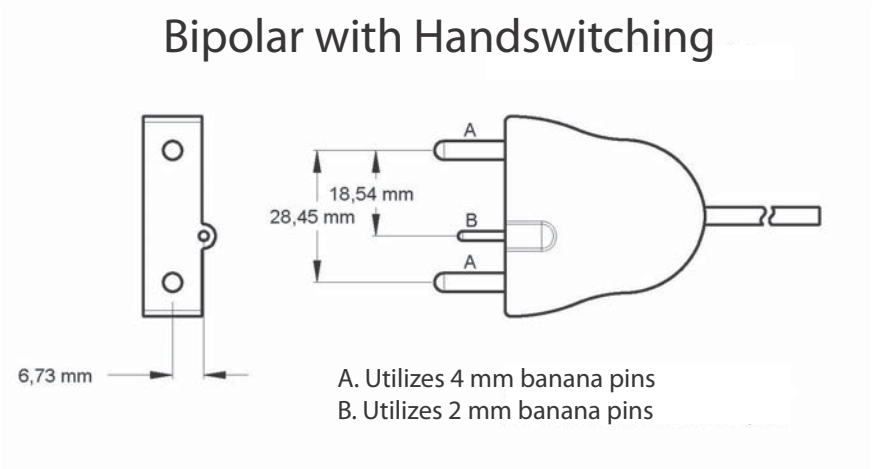
Precaution
Do not use instruments with flying leads with the VLFT10GEN.
Do not use the FT0501 ForceTriad™ Bipolar Adapter with the VLFT10GEN.

Compatible Bipolar Instruments & Devices

The VLFT10GEN is designed for use with Covidien bipolar instruments. However, other bipolar instruments are compatible with the VLFT10GEN if their connectors match the following illustration and are rated for peak voltages of at least 531 V.



Utilizes 4 mm banana pins



The following Covidien catalog numbers for bipolar foot pedals are fully compatible with the VLFT10GEN.

Foot Pedals

E6009 Valleylab Bipolar Standard Footswitch
E6009B Valleylab Bipolar Standard Footswitch
E6019 Valleylab Bipolar Dome Footswitch

Bipolar Adapter

The VLFT10ADP1 Bipolar Adapter allows bipolar instruments to connect to the Ligasure/ Bipolar receptacle, thereby enabling the use of a second bipolar instrument.

Bipolar Resection

Bipolar Resection configures the LigaSure/Bipolar receptacle to use bipolar-resection resectoscopes.

Accessories

FT0021S ForceTriad Bipolar Resection Cord
FT0022W ForceTriad Bipolar Resection Cord
FT6009 ForceTriad FT Series Bipolar Resection Footswitch (with adapter)
1060355 Valleylab FT10 Bipolar Resection Footswitch Adapter

Effect-Settings Reference Chart

Effect Setting	CUT Initiation Current (amps)	CUT (watts)	COAG (max RMS volts)
1	1.8	80	25
2	1.8	120	50
3	2.1	120	75
4	2.4	120	100
5	2.4	160	125
6	2.4	200	150

LigaSure

LigaSure tissue fusion can be used on arteries, veins, pulmonary vasculature, and lymphatics—up to and including 7 mm in diameter—and tissue bundles. When used with compatible instruments, the system provides precise energy delivery and electrode pressure to vessels for a controlled time period to achieve a complete and permanent fusion of the vessel lumen. The system has been designed to produce minimal sticking, charring, and thermal spread to adjacent tissue.

Warning

The tissue fusion function has not been shown to be effective for tubal sterilization or tubal coagulation for sterilization procedures. Do not use this function for these procedures.

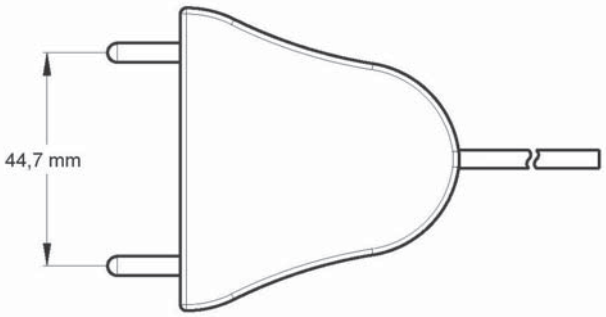
LigaSure Instruments

The LigaSure instruments that complete the VLFT10GEN tissue-fusion system include reusable and single-use instruments for open and laparoscopic procedures. Each reusable instrument requires a corresponding single-use electrode. The LigaSure function is only available when using compatible instruments.

Compatible LigaSure Instruments & Devices

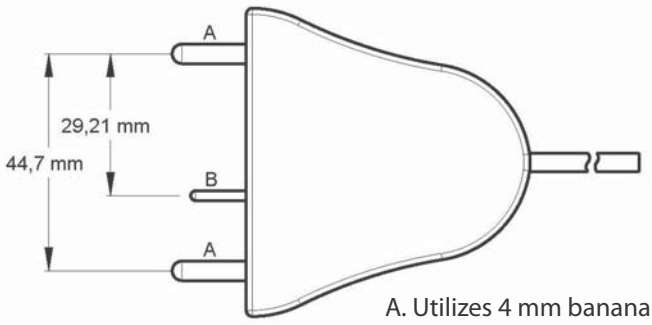
This generator is designed for use with Covidien LigaSure instruments that have a connector that matches the following figures and are rated for peak voltages of at least 244 V. However, it does not recognize all LigaSure instruments. Please refer to the cover of the instructions for use to confirm if a specific LigaSure catalog number is compatible with the VLFT10GEN.

LigaSure

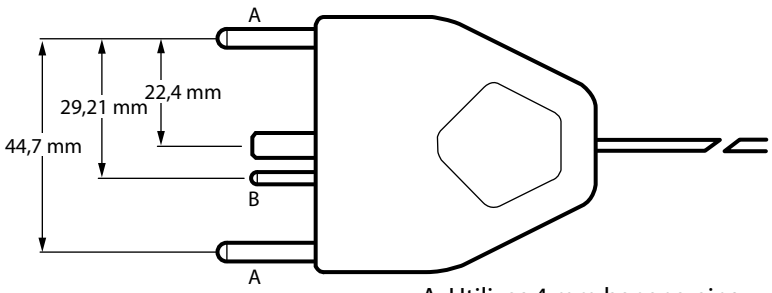


Utilizes 4 mm banana pins

LigaSure with Switching



A. Utilizes 4 mm banana pins
B. Utilizes 2 mm banana pins



A. Utilizes 4 mm banana pins
B. Utilizes 2 mm banana pins

The following LigaSure foot pedal is fully compatible with the VLFT10GEN.

Foot Pedal

LS0300 Tissue Fusion Footswitch, Purple

Connection to External Systems

The VLFT10GEN can be connected to an external system. For example, connections can be made to enable smoke evacuation or EKG blanking during monopolar activation, or provide argon-enhanced coagulation. There are two external system receptacles on the back of the VLFT10GEN that can signal RF activation. The receptacles are labeled Monopolar 1 and Monopolar 2. They both signal RF activation whenever RF energy from any of the RF receptacles is initiated. Refer to the external system user's guide for detailed instructions regarding how to connect it to the generator.

External Systems Compatible with the VLFT10GEN

SEA3730 RapidVac™ Smoke Evacuator Interlink Cable
SE3690 RapidVac Smoke Evacuator
Force™ Argon II-20 Argon Gas Delivery Unit II

Warning

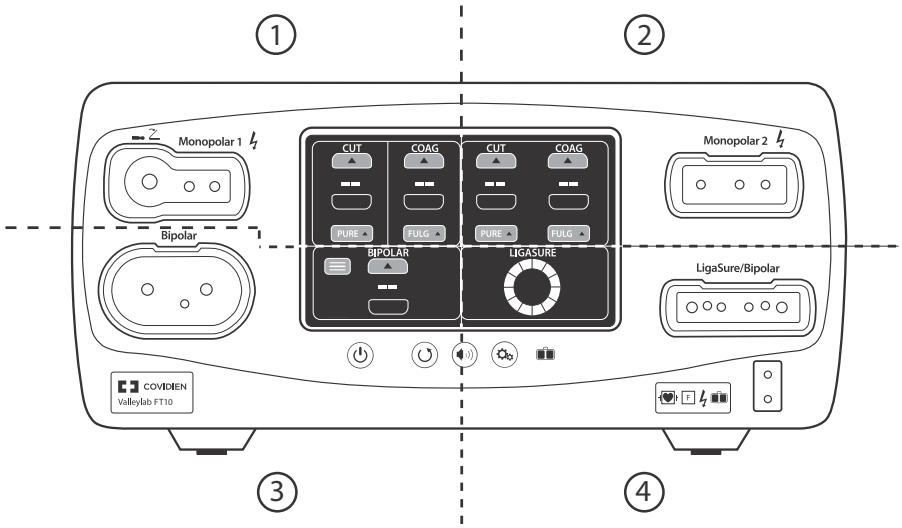
Only medical devices compliant with IEC 60601-1 may be connected to the external system receptacles. The use of any external system connected to the VLFT10GEN should be evaluated by qualified personnel.

System Conventions

The Touchscreen

The VLFT10GEN features a user-friendly touchscreen interface to control system functions. The touchscreen is divided into quadrants; each of the four sections is associated with an adjacent instrument receptacle.

- **Quadrant 1**—Settings entered in the touchscreen control an instrument attached to the Monopolar 1 receptacle.
- **Quadrant 2**—Settings entered in the touchscreen control an instrument attached to the Monopolar 2 receptacle.
- **Quadrant 3**—Settings entered in the touchscreen control an instrument attached to the Bipolar receptacle.
- **Quadrant 4**—The touchscreen displays instrument-specific options and activation of LigaSure and Bipolar Resection devices.



Generator States

The appearance of touchscreen components indicates one of the three states of the system.

Edit

When the system is powered on and no instrument is attached, the instrument controls in the monopolar and bipolar sections can be preset. The following illustration shows monopolar controls edited prior to inserting an instrument.

Inserted

The controls change from the edit stage's flat gray to a brightly illuminated color when an instrument is inserted into the associated receptacle. The following illustration shows the monopolar controls when a two-button pencil is inserted.

Activation

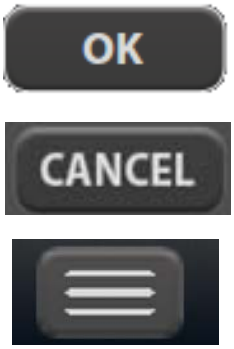
The black background illuminates brightly when the instrument is activated. The following illustration shows the two-button pencil is currently delivering energy for PURE CUT. The mode controls are locked during activation preventing any change in the mode. Power settings can be changed during activation.

System Buttons

There are four buttons on the energy platform's front panel:

	On/Off	Turns system power on and off. To turn power on, hold the button for 0.25 seconds To turn off, hold the button for 1 second. To reset a non-responsive system, hold for 10 seconds.
	Restore Settings	Restores settings from the last time the system was powered down using the On/Off button.
	Audio Volume	Displays the volume pop-up menu to adjust sound levels.
	Service/Settings	Displays the service/settings menu.

Interface Conventions

Interface Element	Name	Description
	Pop-up window/ menu	Pop-up windows and menus appear on screen when user input is needed or requested. Pop-ups close if the user touches anywhere outside of the pop-up window.
	Up/Down arrows	Up and down arrows indicate additional values or selections are available for the current setting. For numeric values, press the up or down arrow to increase or decrease the displayed value. When the value is at its maximum or minimum available setting, the appropriate arrow button becomes inactive.
	**Software Buttons**	Options and confirmations are represented by virtual buttons on the touchscreen. Touch on-screen buttons to select preference.
	Toggle Switches	Touch the virtual toggle switches to enable (ON) or disable (OFF) options or functions.

Chapter 2

Warnings and Precautions for Patient and Operating Room Safety

The safe and effective use of electrosurgery depends to a large degree upon factors solely under the control of the operator. There is no substitute for a properly trained and vigilant surgical team. It is important that the operating instructions supplied with this or any electrosurgical equipment be read, understood, and followed.

Electrosurgery has been used safely in millions of procedures. Before starting any surgical procedure, the surgeon should be trained in the particular technique and surgical procedure to be performed, should be familiar with the medical literature related to the procedure and potential complications, and should be familiar with the risks versus the benefits of utilizing electrosurgery in the procedure.

Conventions Used in this Guide

Warning
Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

Precaution
Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.

Notice
Indicates a hazard which may result in product damage.

Important
Indicates an operating tip or maintenance suggestion.

General Warnings and Precautions

Fire/Explosion Hazards

Warning

Danger - Explosion Hazard Do not use electrosurgery in the presence of flammable anesthetics or oxidizing gases (such as nitrous oxide (N_2O and oxygen) or in close proximity of to volatile solvents (such as ether or alcohol).

Fire Hazard Do not place active instruments near or in contact with flammable materials (such as gauze or surgical drapes). Electrosurgical instruments that are activated or hot from use can cause a fire. When not in use, place electrosurgical instruments in a safety holster or safely away from patients, the surgical team, and flammable materials.

Sparking and heating associated with electrosurgery can be an ignition source. Keep gauze and sponges wet. Keep electrosurgical electrodes away from flammable materials and oxygen (O_2) enriched environments.

Use of electrosurgery in O_2 rich environments increases the risk of fire. Therefore, take measures to reduce the O_2 concentration at the surgical site.

If possible, stop supplemental oxygen at least one minute before and during use of electrosurgery.

The use of non-flammable agents is recommended for cleaning and disinfecting wherever possible. If flammable agents are used, do not activate the energy platform until flammable vapors from skin-preparation solutions and tinctures have dissipated.

There is a risk of pooling of flammable solutions under the patient or in body depressions, such as the umbilicus, and in body cavities, such as the vagina. Any fluid pooled in these areas should removed before activating the energy platform.

Avoid the accumulation of naturally occurring flammable gases that may accumulate in body cavities such as the bowel.

Prevent the accumulation of flammable or oxidizing gases or vapors under surgical drapes or near the surgical site.

Tissue buildup (eschar) on the tip of an active electrode may create embers that pose a fire hazard, especially in oxygen-enriched environments. Keep the electrode clean and free of all debris.

Facial and other body hair is flammable. Water soluble surgical lubricating jelly may be used to cover hair close to the surgical site to decrease flammability.

Verify that all anesthesia circuit connections are leak free before and during use of electrosurgery.

Fire Hazard During Oropharyngeal Surgery

Verify endotracheal tubes are leak free and that the cuff seals properly to prevent oxygen leaks.

If an uncuffed tube is in use, pack the throat with wet sponges around the uncuffed tube, and be sure to keep sponges wet throughout the procedure.

Question the need for 100% O_2 during oropharyngeal or head and neck surgery.

If necessary, scavenge excess O_2 with separate suction.

Do not attempt to recharge the generator's lithium battery. This can cause the battery to explode.

System Setup Warnings and Precautions

Warning
Electric Shock Hazard Connect the system power cord to a properly grounded power receptacle. Do not use power plug adapters.
Electric Shock Hazard When taking measurements or troubleshooting the system, take appropriate precautions, such as using isolated tools and equipment, using the "one hand rule," etc.
Electric Shock Hazard Do not touch any exposed wiring or conductive surfaces while the system is disassembled and energized. Never wear a grounding strap when working on an energized system.
Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least 5 minutes before replacing parts.
Position the generator where it can be easily unplugged in an emergency.
Fire Hazard Do not plug into a power strip or extension cord.
Patient Safety Use the energy platform only if the power-on self-test has been completed as described in this manual, otherwise inaccurate power outputs may result.
Hazardous Electrical Output This equipment is for use only by trained, licensed physicians. Do not use electrosurgical equipment unless properly trained to use it in the specific procedure being undertaken. Use of this equipment without such training can result in serious, unintended patient injury, including bowel perforation and unintended, irreversible tissue necrosis.
Do not touch the patient while touching a connector or fuse contact at the same time. Simultaneous contact can cause electric shock or burns.
Do not wrap the instrument cords or patient-return-electrode cords around metal objects. This may induce currents (capacitive coupling) that could lead to shocks, fires, or injury to the patient or surgical team.
Electric Shock Hazard Do not connect wet instruments to the energy platform. Ensure that all instruments and adapters are correctly connected and that no metal is exposed at any connection points.
Confirm proper power settings before proceeding with surgery. If the proper power settings are not known, set the power to a low setting and cautiously increase the power until the desired effect is achieved. If increased power settings are requested, check the patient return electrode and all instrument connections before major power-setting adjustments.
Contact between the active electrode and any metal will greatly increase current flow and can result in unintended surgical effect.

Warning

While using electrosurgery, the user and patient should not be allowed to come into direct contact with grounded metal objects (e.g., surgical-table frame, instrument table, etc.). If this is not possible during certain procedures (e.g., those in which noninsulated head frames are used), use extreme caution to maximize patient safety:

- Use the lowest power setting that achieves the desired effect.
- Place the patient return electrode as close to the surgical site as possible.
- Place dry gauze between the patient and the grounded object if possible.
- Continually monitor the contact point(s).
- Do not use metal needle monitoring electrodes.

Warning

Ensure the UFP connector is fully inserted in the generator prior to use. A partially inserted connector may result in injury to the surgical team if the exposed connector is touched during use.

Precaution

Read the instructions, warnings, and precautions provided with this energy platform and associated accessories before using. Specific instructions for electrosurgical instruments are not included in this manual.

Read the instructions, warnings, and precautions provided with electrosurgical instruments before using. Specific instructions for electrosurgical instruments are not included in this manual.

Always use the lowest power setting that achieves the desired surgical effect. The active electrode should be utilized only for the minimum time necessary in order to lessen the possibility of unintended burn injury. Accidental and unintended burn injury has occurred during procedures in small surgical fields and on small appendages. Pediatric applications and/or procedures performed on small anatomic structures may require reduced power settings. The higher the current flow and the longer the current is applied, the greater the possibility of unintended thermal damage to tissue, especially during use on small structures.

Certain devices or accessories may present an unacceptable risk at low power settings. For example, with argon beam coagulation, the risk of gas embolism increases if there is insufficient high frequency (HF) power to produce a rapid, impermeable eschar on the target tissue.

For surgical procedures where the current could flow through delicate parts of the body, the use of bipolar techniques may be desirable in order to avoid unwanted coagulation.

Connect only Covidien-approved devices. Using devices from other manufacturers may cause equipment malfunction or patient injury.

Examine all instruments and connections to the system before using. Improper connection may result in arcs, sparks, instrument malfunction, or unintended surgical effects.

Do not operate the generator for clinical use while cables are connected to the utility WiFi receptacle or Ethernet receptacles on the back of the generator. This may cause a system error that would halt the procedure and require restarting the generator.

Precaution
Do not turn the activation tone down to an inaudible level. The activation tone alerts the surgical team when the energy platform is delivering RF energy.
When using a smoke evacuator in conjunction with the VLFT10GEN, set the system volume control at a level that ensures the activation tones can be heard.
A non-functioning VLFT10GEN may cause an interruption of surgery. A backup system should be available for use.
Inadvertent activation may occur while installing, removing, or bending electrodes. Ensure that the instrument cord is not connected to the VLFT10GEN or that the system is off.
Leads connected to the patient should be positioned in such a way that contact with the patient or other leads is avoided because the capacitance between the electrode cable and the patient may result in some local high current densities. When not in use, place electrosurgical instruments in a safety holster or safely away from patients, the surgical team, and flammable materials.
Studies have shown that smoke generated during electrosurgical procedures can be potentially harmful to patients and the surgical team. These studies recommend adequately ventilating the smoke by using a surgical-smoke evacuator or other means.[1]

1. U.S. Department of Health and Human Services. National Institute for Occupational Safety and Health (NIOSH). Control of Smoke from Laser/Electric Surgical Procedures. HAZARD CONTROLS, Publication No. 96-128, September, 1996

Notice
Connect the power cord to a properly grounded power receptacle having the correct voltage. Otherwise, product damage may result.
The VLFT10GEN requires special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in Chapter 4, *Technical Specifications*.
Portable and mobile RF communications equipment can affect the VLFT10GEN. Refer to the EMC information provided in Chapter 4, *Technical Specifications*.
The system should not be used adjacent to or stacked with equipment other than specified in the *Valleylab FT10 Energy Platform User Guide and Service Manual*. If adjacent or stacked use is necessary, the system should be observed to verify normal operation in the configuration in which it will be used.
The system intentionally applies RF energy for diagnosis or treatment during activation. Observe other electronic medical equipment in the vicinity during the system activation for any possible adverse electromagnetic effects. Ensure adequate separation of electronic medical equipment based on observed reactions.
The use of accessories, other than specified in the *Valleylab FT10 Energy Platform User Guide and Service Manual*, may result in increased emissions or decreased immunity of the system.
Before plugging the generator into a power receptacle, verify that the installed fuses are appropriate for the local input line voltage. See *Input Power* on page 4-3.

Notice

Calibration must be performed on a non-conductive surface. Do not use antistatic bench-top mats. When performed on a conductive surface, calibration values may not be accurate.

After completing calibration, the system will reboot to the clinical screen to save the values or abort the calibration.

Important

The VLFT10GEN is intended for use in a hospital or medical center environment.

If required by local codes, connect the energy platform to the hospital potential equalization system with an equipotential cable.

The operator of the generator may be as far away from the generator as 2 feet (direct product interaction), 5 feet (inside the sterile field), and 13 feet (across the room working with other equipment).

RFID and WiFi function may be interfered with by other equipment even if that other equipment complies with CISPR emission requirements.

Log files are maintained when the system is powered down. The time when the system was powered down or experiences a total loss of power is also logged.

When log files reach capacity, the earliest log is deleted to make room for the newest log.

Generator log files can be uploaded for viewing on a computer using Valleylab Exchange. Refer to the *Valleylab Exchange Remote Software System User's Guide* available at http://www.medtronic.com/covidien/support/valleylab-exchange.

The VLFT10GEN contains substances of very high concern as defined in Article 57 and Annex XIV of Regulation (EC) No 1907/2006 (Registration, Evaluation, Authorization, and Restriction of Chemicals [REACH]). Specifically, it contains di-(2-ethylhexyl)phthalate (DEHP) (CAS number 117-81-7; EC number EN 204-211-0) and 1,2 dimethoxyethane, ethylene glycol dimethyl ether (EGDME) (CAS number 110-71-4; EC number EN 203-794-9) in concentrations above 0.1% by weight.

Warnings and Precautions for the Energy Platform

Warning

Each instrument receptacle on this energy platform is designed to accept only one instrument at a time. Follow the instructions provided with electrosurgical instruments for proper connection and use.

Failure of the generator could result in an unintended increase of output power or activation.

Only medical devices compliant with IEC 60601-1 may be connected to the external system receptacles. The use of any external system connected to the VLFT10GEN should be evaluated by qualified personnel.

Precaution

Do not stack equipment on top of the energy platform or place the energy platform on top of electrical equipment. This is an unstable configuration and does not allow for adequate cooling.

Provide at least 4" to 6" (10 to 15 cm) of unobstructed space round the top and sides of the generator to ensure proper cooling.

Provide as much distance as possible between the energy platform and other electronic equipment (such as monitors). Do not cross or bundle cords from electronic devices. This energy platform may cause interference with other electronic equipment.

The use of monitoring systems that incorporate high-frequency current-limiting devices is recommended to reduce interference with the monitoring device.

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle Printed Circuit Board Assemblies (PCBA) by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Make no modifications to the electrosurgical generator. Any modifications to the system will void the warranty.

When testing RF equipment, follow these test procedures. Keep test leads to the minimum length usable; lead inductance and stray capacitance can adversely affect readings. Carefully select suitable ground points to avoid ground loop error in measurements.

The accuracy of most RF instruments is approximately 1%–5% of full scale. Using uncompensated scope probes causes large errors when measuring high-voltage RF waveforms.

Warnings and Precautions for Active Instruments

Warning

Energy applied to an electrosurgical instrument can convert liquids to steam. The thermal energy of steam may cause unintended injury in close proximity to the tip of the instrument. Care should be taken in surgical procedures occurring in confined spaces in anticipation of this possibility.

Do not activate the energy platform in an open-circuit condition. To reduce the chances of unintended burns, activate the energy platform only when the active electrode is near or touching the target tissue.

Use the lowest power setting that achieves the desired surgical effect and use a low-voltage waveform (PURE CUT, BLEND, or VALLEYLAB mode) to lessen the potential for the creation of capacitive currents.

If energy delivery from the generator cannot be stopped, remove the handpiece from the patient and disconnect the handpiece or power cord.

Warning

Do not activate the instrument when not in contact with target tissue as this may cause injuries due to capacitive coupling.

The surface of the active electrode may remain hot enough to cause burns after the RF current is deactivated.

Keep the active electrodes clear. Build-up of eschar may reduce the instrument's effectiveness. Do not activate the instrument while cleaning. Injury to operating room personnel may result.

Precaution

Read the instructions, warnings, and precautions provided with electrosurgical instruments before using. Specific instructions for electrosurgical instruments are not included in this manual.

Inspect instruments and cords—especially for laparoscopic/endoscopic instruments—for breaks, cracks, nicks, and other damage before every use. If damaged, do not use. Damaged instruments or cords may result in injury or electrical shock to the patient or surgical team.

Use only instruments that can withstand the maximum output (peak) voltage for each output mode as listed in Chapter 4, *Technical Specifications*. Using an instrument with a voltage rating that is lower than the maximum output voltage may result in injury to the patient or the operator, or damage to the instrument.

Information on voltage ratings for non-Covidien instruments should be obtained from the instrument's manufacturer.

Notice

All Covidien instruments have voltage ratings that are greater than the maximum output voltages in the VLFT10GEN.

Inspect instrument plugs for wear before every use. Worn plugs may result in a loose or stuck connection to the generator.

Warnings for Implanted Electronic Devices (IEDs)

IEDs include, but are not limited to, pacemakers, neurostimulators, implantable cardioverter defibrillators (ICDs), ventricular assist devices (VAD), spinal cord stimulators, cochlear implants, infusion pumps, and bone growth stimulators.

Warning

Use the system with caution in the presence of internal or external pacemakers or other implanted devices. Interference produced by electrosurgical equipment can cause a pacemaker or other device to enter an unsafe mode or permanently damage the device. Consult the device manufacturer or responsible hospital department for further information when use is planned in patients with implanted medical devices.

Post Surgery Safety Issues

Warning

Shock Hazard Before cleaning or servicing the unit, disconnect the power plug from the power outlet in order to completely isolate the generator from mains power.

Notice

Do not clean the energy platform with abrasive cleaning or disinfectant compounds, solvents, or other materials that could scratch the panels or damage the energy platform.

Warnings and Precautions for Monopolar Procedures

Warning

Simultaneously activating suction/irrigation and electrosurgical current may result in increased arcing at the electrode tip, burns to unintended tissues, or shocks and burns to the surgical team.

Power output of a two- or three-button pencil (COAG selection) can change during use when another monopolar instrument is activated.

Some surgeons may elect to "buzz the hemostat" during surgical procedures. It is not recommended, and the hazards of such a practice probably cannot be eliminated. Burns to the surgeon's hands are possible. To minimize the risk take these precautions:

- Do not buzz the hemostat with a needle electrode.
- Do not lean on the patient, the table, or the retractors while buzzing the hemostat.
- Activate CUT rather than COAG. CUT has a lower voltage than COAG.
- Firmly grasp as much of the hemostat as possible before activating the energy platform. This disperses the current over a larger area and minimizes the current concentration at the finger tips.
- Buzz the hemostat below hand level (as close as possible to the patient) to reduce the opportunity for current to follow alternate paths through the surgeon's hands.
- Use the lowest power setting possible for the minimum time necessary to achieve hemostasis.
- Activate the energy platform after the instrument makes contact with the hemostat. Do not arc to the hemostat.
- When using a coated- or nonstick-blade electrode, place the edge of the electrode against the hemostat or other metal instrument.

DEMO mode delivers monopolar energy without the use of a patient return electrode, and is intended for demonstration purposes only. Chance of burns to the patient significantly increase when DEMO mode is used for clinical procedures.

Precaution

To provide expected functionality from a hand piece, proper insertion is required. Refer to the alignment dots below the receptacles for proper insertion orientation.

The use of modes that produce electrical arcs between the active electrode and tissue may result in neuromuscular stimulation.

Warnings and Precautions for Patient Return Electrodes

Warning

It is not possible to foresee what combination of current and duty cycle may be safely used in every situation—for example, when higher currents and/or longer duty cycles are used on procedures such as tissue lesioning, tissue ablation, tissue vaporization; and procedures where conductive fluid is introduced into the surgical site. Under these conditions a greater risk may exist that the heating under a fully applied return electrode may be high enough to injure the patient.

When using a Covidien energy platform or a patient return electrode during these types of surgical procedures, the user should seek written guidance in the form of detailed user instructions from the manufacturer of the active accessory regarding the currents and duty cycles that can be expected. In some instances, the application of additional patient return electrodes may help mitigate the increased risk.

Do not attempt to use patient return electrodes that disable the Return Electrode Monitoring (REM) system. The VLFT10GEN REM system will function correctly only with contact quality monitoring (CQM) split-style patient return electrodes. Other patient-return-electrode products may not identify loss of safe contact between the return electrode and the patient, thereby failing to provide an auditory alarm and causing patient injury or product damage.

The safe use of monopolar electrosurgery requires proper placement of the patient return electrode. To avoid electrosurgical burns beneath the patient return electrode, follow all directions provided with the product.

Do not cut a patient return electrode to reduce its size. Patient burns due to high current density may result.

To avoid patient burns, ensure that the patient return electrode makes firm and complete contact with the skin. Always check the patient return electrode periodically, after the patient is repositioned, and during procedures involving long periods of activation.

Use of duty cycles greater than 25% (10 seconds active followed by 30 seconds inactive) will increase the risk that heat build-up under a return electrode may be high enough to injure the patient. Do not continuously activate for longer than one minute.

Apparent low-power output at the normal operating settings may indicate faulty application of the return electrode. Verify the return electrode is correctly placed and attached to the patient as described in the electrode's instructions for use. Verify the connection between the electrode and the generator before selecting a higher output power.

Warning

DEMO mode does not monitor the quality of pad contact with the patient. No warning will be issued from the generator when a non-REM return electrode's pad-to-patient contact degrades when in DEMO mode.

Precaution

Covidien REM Polyhesive patient return electrodes are recommended for use with the VLFT10GEN. Return electrodes from other manufacturers may not provide proper impedance to work correctly with the energy platform.

Important

A statement of compatibility from the CQM patient return electrode manufacturer should be obtained prior to the use of a non-Covidien CQM patient return electrode.

A patient return electrode is not necessary in bipolar or LigaSure procedures.

Inadvertent Radio Frequency (RF) Burns

Warning

Electrodes and probes used with monitoring, stimulation, and imaging devices (or similar equipment) can provide a path for high frequency current even if the electrodes or probes are isolated at 50 –60 Hz, insulated, and/or battery operated.

Do not use needles as monitoring electrodes during electrosurgical procedures. Inadvertent electrosurgical burns may result.

To reduce the risk of an inadvertent electrosurgical burn at the monitoring electrode or probe site, place the electrode and/or probe as far away as possible from the electrosurgical site and/or patient return electrode. Protective impedances (resistors or RF inductors) installed in the monitoring leads may reduce the risk of such burns. Consult the hospital biomedical engineer for further information.

Warning

In some circumstances, the potential exists for alternate site burns at points of skin contact (e.g., between the arm and the side of the body). This occurs when electrosurgical current seeks a path to the patient return electrode that includes the skin-to-skin contact point. Current passing through small skin-to-skin contact points is concentrated and may cause a burn. This is true for ground referenced and isolated output electrosurgical energy systems.

To reduce the potential for alternate site burns, do one or more of the following:

- Avoid skin-to-skin contact points, such as fingers touching leg or knee touching knee when positioning the patient.
- Place insulation, such as dry gauze or towel, between contact points to ensure that contact does not occur.
- Position the patient return electrode to provide a direct current route between the surgical site and the return electrode which avoids skin-to-skin contact areas.
- In addition, place patient return electrodes according to the manufacturer's instructions.

Warnings and Cautions for Laparoscopic Procedures

Warning

For laparoscopic procedures, be alert to these potential hazards:

- Laparoscopic surgery may result in gas embolism due to insufflation of gas in the abdomen.
- The electrode tip or LigaSure jaws may remain hot enough to cause burns after the electrosurgical current is deactivated.
- Inadvertent activation or movement of the activated instrument electrode or jaws outside of the field of vision may result in injury to the patient.
- Localized burns to the patient or physician may result from electrical currents carried through conductive objects (such as other instrument, cannulas, or scopes). Electrical current may be generated in conductive objects through direct contact with the active electrode or jaws, capacitative coupling, or by the active instrument (electrode or cable) being in close proximity to the conductive object.
- Do not use hybrid trocars that have a non-conductive locking anchor placed over a conductive sleeve. For the operative channel, use all-metal or all-plastic systems. At no time should electrical energy pass through hybrid systems. Capacitive coupling of RF current may cause unintended burns.
- When using laparoscopic instrumentation with metal cannulas, the potential exists for burns to the abdominal wall due to direct electrode contact or capacitive coupling of RF current. This is most likely to occur in instances where the energy platform is activated for extended periods at high power levels inducing high current levels in the cannula.
- Carefully insert and withdraw LigaSure instruments from cannulas to avoid possible damage to the devices and/or injury to the patient.
- Ensure that the insulation of single-use and reusable laparoscopic instrumentation is intact and uncompromised. Compromised insulation may lead to inadvertent metal-to-metal sparking and neuromuscular stimulation and/or inadvertent sparking to adjacent tissue.
- Do not activate the LigaSure function in an open-circuit condition. Activate the energy platform only when the instrument is near or in direct contact with the target tissue to reduce the possibility of unintended burns.

Covidien recommends against the use of laparoscopic surgery on pregnant patients.

Warnings and Precautions for Bipolar Procedures

Warning

Use of different Covidien cord models or cords from other manufacturers may not achieve proper electrical output for this device, thereby failing to produce the desired clinical effect. For example, Auto Bipolar activation/deactivation settings may not work properly using cords other than those specified by Covidien.

In the Auto Bipolar setting, activation may occur with contact of any material. When not in use, place electrosurgical instruments in a safety holster or safely away from patients, the surgical team, and flammable materials.

Precaution

Bipolar instruments must be connected to the Bipolar instrument receptacle only. Improper connection may result in inadvertent system activation.

Do not use instruments with flying leads with the VLFT10GEN.

Do not use the FT0501 ForceTriad Bipolar Adapter with the VLFT10GEN.

Bipolar forceps should not be set down while Auto Bipolar is active. Contact with any material may cause activation. Turn off Auto Bipolar before setting down an instrument.

Warnings and Precautions for LigaSure Procedures

Warning

LigaSure instruments are intended for use only with compatible Covidien generators and energy platforms. See the front cover of the instrument's instructions for a list of compatible generators. Use of these instruments with other generators may not result in electrical output that they were designed for, and may not result in the desired clinical effect.

The tissue fusion function has not been shown to be effective for tubal sterilization or tubal coagulation for sterilization procedures. Do not use this function for these procedures.

Tissue fusion requires the application of RF energy and pressure from the instrument. Ensure grasping pressure is maintained until the seal cycle is complete.Tissue to be sealed must be firmly grasped between the instrument jaw electrodes. Tissue in the jaw hinge or outside the instrument jaw may not be sealed even if thermal blanching occurs.

If the seal-cycle-complete tone has not sounded, an optimal seal may not have been achieved. Reactivate the RF energy until a seal-cycle-complete tone is heard.

Do not activate the energy platform until the tissue-fusion or LigaSure instrument has been applied with the proper pressure. Do not release the pressure on the tissue until the end tone has sounded. Activating the energy platform with improper grasping pressure applied may result in an improper seal and may increase thermal spread to tissue outside the surgical site.

Warning

Fluid in the body cavity should be kept to a minimum during treatment. Conductive fluids (e.g., blood or saline) in direct contact with, or in close proximity to, the instrument may carry electrical current or heat, which may cause unintended burns to the patient. Aspirate fluid from around the instrument jaws before activating the instrument.

Do not attempt to seal or cut over clips or staples as incomplete seals may be formed.

Precaution

Energy-based devices, such as electrosurgical pencils or ultrasonic scalpels, that are associated with thermal spread should not be used to transect seals.

Warnings and Precautions for Bipolar Resection

Warning

Bipolar Resection mode is intended to be used only with compatible resectoscopes for endoscopically controlled removal (resection) or coagulation of tissue using 0.9% NaCI solution (saline) as the irrigation medium

Precaution

Bipolar Resection mode is supported only if a Covidien-specified bipolar resection instrument is connected to the LigaSure/Bipolar receptacle with a Covidien bipolar resection cord. In addition, Bipolar Resection mode can be activated only with the Covidien Bipolar Resection foot pedal connected to the LigaSure/Bipolar foot-pedal receptacle. See the cords IFU listed in *Accessories* on page 1-11 for the list of supported bipolar resection instruments and cords.

Servicing

Warning

Electric Shock Hazard Do not remove the energy platform cover. Contact qualified personnel for service.

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

Notice

Refer to this service manual for maintenance recommendations, and function and output-power verification procedures.

Do not spray cleaning fluids directly on the generator as damage to the generator may occur.

The latest version of the *Valleylab FT10 Energy Platform Service Manual* is available at http://www.medtronic.com/covidien/support/biomed-connect/electrosurgery.
Call these numbers to request a hardcopy of the service manual

- USA and Canada: 1 800 255 8522 Option 2
- International: 1 303 476 7996

Shunt Cords

Warning

Some surgical instruments (e.g., colonoscopes) may allow substantial leakage current that could burn the surgeon. If the instrument manufacturer recommends the use of a shunt cord (s-cord) to direct the current back to the energy platform, an E0507-B adaptor must also be used. To avoid a REM alarm, a REM Polyhesive patient return electrode with the E0507-B adaptor must be used.

Conductive Fluid In the Surgical Site

Warning

When this energy platform is used in monopolar procedures where conductive fluid (including, but not limited to saline or lactated Ringer's) is introduced into the surgical site for distention or to conduct RF current, higher than normal currents (greater than one amp) may be produced. In this situation, use one or more adult-size return electrode. Do not use return electrodes labeled for children, infants, babies, neonatal use, or pediatric use.

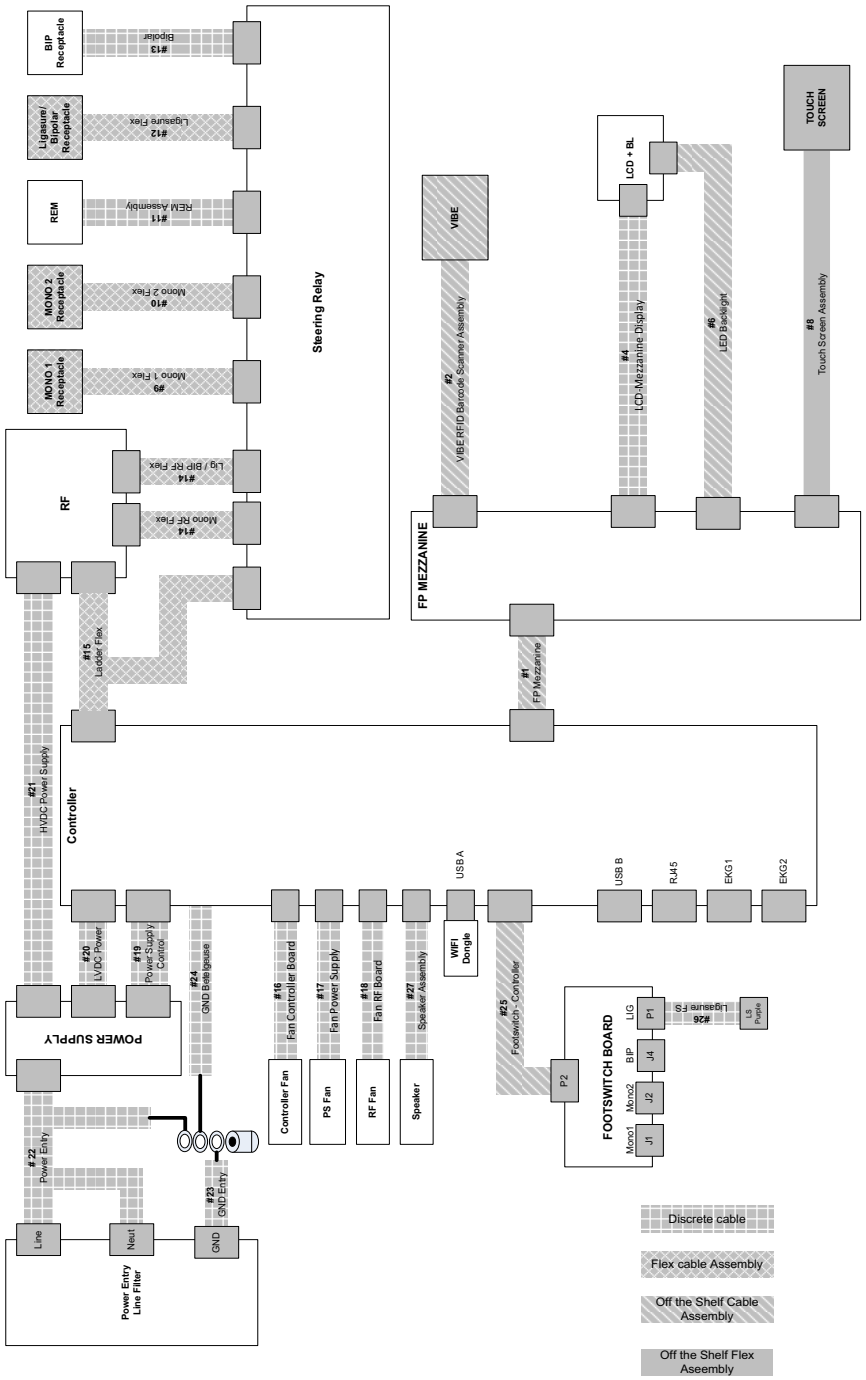
Use of duty cycles greater than 25% (10 seconds active followed by 30 seconds inactive) will increase the risk that heat build-up under a return electrode may be high enough to injure the patient. Do not continuously activate for longer than one minute.

Chapter 3

Principles of Operation

This chapter provides information about how the VLFT10GEN functions and how the internal components interact.

Block Diagram



Cable Part Numbers

Cable Number	Cable Name
#1	FP Mezzanine
#2	VIBE RFID Scanner Assy
#4	LCD-Mezzanine Display
#6	LED Backlight
#8	Touch Screen Assembly
#9	Mono 1 Flex
#10	Mono 2 Flex
#11	REM Assembly
#12	LigaSure Flex
#13	Bipolar
#14	Mono RF Flex
#14	Lig/BIP RF Flex
#15	Ladder Flex
#16	Fan Controller Board
#17	Fan Power Supply
#18	Fan RF Board
#19	Power Supply Control
#20	LVDC Power
#21	HVDC Power Supply
#22	Power Entry
#23	GND Entry
#24	GND Controller
#25	Foot-switch - Controller
#26	LigaSure FS
#27	Speaker Assembly

Electronic Assemblies Principles of Operation

High-Voltage/Low-Voltage Power Supply Principles of Operation

The High-Voltage/Low-Voltage power-supply module provides a complete main power supply solution. It is contained within its own chassis and is cooled by a dedicated system fan.

Controller PCBA

The Controller Printed Circuit Board Assembly (PCBA) serves as the main digital control of the system. It comprises the following features:

- Control of the user interface (touchscreen, push-button, foot pedal, and handpiece activation inputs, LCD, and LEDs)
- Closed-loop control of RF power delivery
- External communications (WiFi and Ethernet)
- Control of smoke-evacuation devices or blanking functionality of an EKG device
- Audio control
- Power-supply control

RF PCBA

The RF PCBA serves primarily to convert a DC voltage sourced from the High Voltage Power supply output to a 434 kHz AC source with an output impedance that is tailored to match the energy modality being sourced. The RF PCBA also houses the RF energy current and voltage sensors which are used to provide closed loop control of the energy delivered to the patient.

Steering Relay PCBA

The Steering Relay PCBA accepts energy from the RF PCBA and directs it toward the intended energy-output receptacle based on energy modality. Non-activated energy receptacles are disconnected from the energy source by way of high-voltage relays. The Steering Relay PCBA houses the REM module, the ISOFirm modules, and the isolated power supply for the REM and ISOFirm modules.

Display PCBA

The Display PCBA houses the touchscreen controller, the LCD backlight driver, and provides an interface for the LCD, VIBE module, and User Interface buttons.

Mechanical Assemblies Principles of Operation

The Chassis assembly consists of 4 major metal mechanical subassemblies (front bezel, chassis base, chassis top, and rear bezel), 3 cooling fans, and a molded foam PCBA mounting structure (Electronic Packaging Assembly Concept—E-PAC™*).

IT Network Connectivity Principles of Operation

The generator connects to an IT network, usually through Valleylab Exchange, for the purpose of registering the generator and its components, updating software, setting the country code, and transmitting error and event logs. The generator cannot connect to an IT network while in clinical mode. Because the generator cannot connect to an IT network while in clinical mode, there are no OR-related hazardous situations. The generator has to be in the service screens for IT network connectivity. The generator can be 1) connected to another computer (point to point connection), 2) connected remotely to a router or to a DHCP server via a WiFi access point broadcasting a non-hidden SSID, or 3) connected via Ethernet cable to a router or directly to the DHCP server. The generator allows wired connections to be either static (assigned by the user) or assigned by the DHCP server. The MAC address is unique to each generator.

Connection of the generator to an IT network that includes other equipment could result in previously unidentified risks. The user should identify, analyze, evaluate, and control these risks. Subsequent changes to the IT network could introduce new risks and require additional analysis. Changes to the IT network include:

- changes to the IT network configuration
- connection of additional items to the IT network
- disconnecting items from the IT network
- update of equipment connected to the IT network
- upgrade of equipment connected to the IT network

Chapter 4

Technical Specifications

Precaution

Read the instructions, warnings, and precautions provided with this energy platform and associated accessories before using. Specific instructions for electrosurgical instruments are not included in this manual.

VLFT10GEN Specifications

General

Output configuration	Isolated output
Cooling	Natural convection and fan
Display	7.0 in. (17.8 cm.) LCD touchscreen
Connector receptacles	LED illuminated connector readers on the LigaSure/Bipolar receptacle
Enclosure	Magnesium
Mounting	• Valleylab Universal Generator Cart (VLFTCRT) • Operating-room boom systems • Any stable, flat surface such as a table or cart top
Operating System	Linux™*

Important

The VLFT10GEN contains substances of very high concern as defined in Article 57 and Annex XIV of Regulation (EC) No 1907/2006 (Registration, Evaluation, Authorization, and Restriction of Chemicals [REACH]). Specifically, it contains di-(2-ethylhexyl)phthalate (DEHP) (CAS number 117-81-7; EC number EN 204-211-0) and 1,2 dimethoxyethane, ethylene glycol dimethyl ether (EGDME) (CAS number 110-71-4; EC number EN 203-794-9) in concentrations above 0.1% by weight.

Dimensions and Weight

Height	7.0 in. (17.8 cm)
Width	14.5 in. (36.8 cm)
Length	18.2 in. (46.2 cm)
Weight	22.3 lb. (10.1 kg)

Environmental Parameters

	Operation	Transport and Storage [1,2]
Ambient temperature range	50 to 104 °F (10 to 40 °C)	14 to 140 °F (-10 to +60 °C)
Relative humidity	15% to 85% non-condensing	15% to 90% non-condensing
Atmospheric pressure	700 to 1060 millibars	500 to 1060 millibars

1. The system can be stored for up to one year without performance degradation upon use.

2. If the generator is stored at a temperature outside the normal operating range of 10 to 40 °C, the system is ready for use after at least one hour at ambient temperature 20 °C ± 5 °C.

Input Power

	Nominal Line Voltage		
	100–127 VAC	**220–240 VAC**	**Units**
Line Ranges			
Line Voltage Full Regulation Range	90–140	198–264	VAC
Line Frequency	47–63	47–63	Hz
Max VA nominal line Voltage[1]	950	950	VA
Max Mains Current[1]	9.5	4.8	A_{RMS}
Max Heat Dissipation	180	180	W
Fuses	10 Fuses (2) – 5 mm x 20 mm 10 A, 250 V fast blow	6.3 Fuses (2) – 5 mm x 20 mm 6.3 A, 250 V fast blow	A
Power Cord	NEMA 3-prong hospital-grade connector		

1. Max VA and current are based on nominal line voltages.

Power Cord Specifications

This system is factory equipped with a 110 VAC hospital grade NEMA 5-15 power cord. Should the AC power cord need to be replaced to match another plug configuration, the replacement plug/cable/receptacle configuration must meet or exceed the following specifications:

- **100-127 VAC**

  Cable - SJT16/3, IEC color code, maximum length 15 ft. (5 m)
  Plug - minimum 10 A - 125 VAC
  Unit receptacle - IEC female, minimum 10 A - 125 VAC

- **220-240 VAC**

  Cable - H05VVF3G1.0 VDE, maximum length 15 ft. (5 m)
  Plug - minimum 6 A - 250 VAC
  Unit receptacle - IEC female, minimum 6 A - 250 VAC

Important

Contact your local Covidien representative for alternative internationally approved power-cord options.

Backup Power

The VLFT10GEN retains all user programmed features, calibration, and statistical data when switched off and unplugged. The VLFT10GEN operates within specification when switched over to a supplied-line power by hospital backup systems.

Real time clock battery	Battery type – Lithium CR1620 or CR1632
	Battery life – 75 mAh minimum

Equipotential Ground Connection

An equipotential ground connection is provided to allow connection of the VLFT10GEN to a common ground by way of a potential equalization connector. This connection meets IEC 60601-1 requirements.

EKG Blanking and Smoke Evacuation

Interlink cable receptacles are provided to signal other devices, such as an EKG or smoke evacuator, that the VLFT10GEN is active. The receptacle is a 2.5 mm mono jack. It is electrically isolated from the internal ground referenced electronics. The shell is electrically isolated from chassis ground.

Internal Memory

Storage capacity	8 GB

Duty Cycle

The VLFT10GEN is capable of operating a duty cycle of 25%, defined as 10 seconds active and 30 seconds inactive, in any mode for a period of four hours.

Precaution

Use of duty cycles greater than 25% (10 seconds active followed by 30 seconds inactive) will increase the risk that heat build-up under a return electrode may be high enough to injure the patient. Do not continuously activate for longer than one minute.

Leakage

Leakage Currents and Patient Auxiliary Currents (IEC 60601-1:2012)	
Touch Current	< 100 µA NC, < 500 µA SFC
Earth Leakage Current	< 500 µA NC, < 1000 µA SFC
Patient Auxiliary Current (< 1kHz)	< 10 µA NC, < 50 µA SFC
Patient Auxiliary Current (> 1kHz)	Scaled with frequency per IEC 60601-1:2012, but does not exceed 10mA NC/SFC
Patient Leakage Current	< 10 µA NC, < 50 µA SFC
Total Patient Leakage Current	< 50 µA NC, < 100 µA SFC

NC—Normal Condition

SFC—Single Fault Condition (as defined in IEC 60601-1:2012)

Total Patient Leakage Current—Measurement of patient leakage current with all patient outputs connected together

High Frequency Leakage (IEC 60601-2-2)	
Bipolar (short leads)	< 68.9 mARMS
Monopolar measured directly at the ESU terminals	< 100 mA_{RMS}
LigaSure/BPR measured directly at the ESU terminals	< 100 mA_{RMS}

Radio Frequency Identification (RFID)

The RFID module is located above the LigaSure/Bipolar receptacle. The intended use of the RFID module is to identify the inserted LigaSure instrument and configure the generator with the data included in the RFID tag.

Transmit/Receive Frequency Range	13.56MHz
RF Output Power	68.17 dBu V/m @3 meter
Type of Antenna	Integral Loop Antenna
Modulation	Amplitude-shift keying (ASK)
Mode of Operation (Simplex / Duplex)	Duplex
Contains Module FCC ID	2AAVI-JDK1901
Contains IC ID	11355A-JDK1901

Wireless Fidelity (WiFi)

The WiFi module is located on the back of the generator. The intended use of the WiFi module is to perform service operations on the generator.

Transmit/Receive Frequency Range	2.4000 ~ 2.4835 GHz (Industrial Scientific Medical Band)
Standards	IEEE 802.11b, 802.11g, 802.11n
RF Output Power	11b: 17 ± 1.5 dBm 11g: 15 ± 1.5 dBm 11n: 14 ± 1.5 dBm
Data Rate	11b: 1/2/5.5/11 Mbps 11g: 6/9/12/24/36/48/54 Mbps 11n: (20 MHz): MCSO-7 (Up to 72 Mbps) 11n: (40 MHz): MCSO-7 (Up to 150 Mbps)
Securities	WPA2
Type of Antenna	Internal Antenna (1T1R)
Contains Module FCC ID	NDD9578111008
Contains IC ID	4701A-78111306

IFETEL Radio Standards Warning Statement

The operation of radios within this equipment is subject to the following two conditions:

1) They shall not cause harmful interference, and
2) They must accept any interference received, including interference that may cause undesired operation.

Industry Canada Statement

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following conditions:

1) This device may not cause interference; and
2) This device must accept any interference, including interference that may cause undesired operation of the device.

RF Exposure Statement

This device meets the requirements for RF exposure when operated at a minimum distance of 20 cm from the user or nearby persons.

EU Short Form Declaration

Hereby, Covidien llc, declares that this wireless LAN and RFID is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

WiFi Device Installation Guide

The translated Quick Installation Guide (QIG) for the WiFi device (EW-7811Un) is available on the Edimax™* website in many languages. It is at the following location: http://www.edimax.com/edimax/download/download/data/edimax/global/download/for_home/wireless_adapters/wireless_adapters_n150/ew-7811un.

Ethernet

The Ethernet connection is located on the back of the generator. The intended use of the Ethernet connection is to perform service operations on the generator.

Connected Speed	10/100/1000Base-T
Standards	IEEE 802.3, IPv4
Protocols	SFTP (for file transfer through port 22), UDP (non-file transfer), TCP/IP

Symbols Used

For prescription use only

Consult instructions for use

Follow instructions for use (blue)

Caution: Consult accompanying documents

The energy platform output is floating (isolated) with respect to ground.

Defibrillation proof

DANGER

Explosion risk if used with flammable anesthetics

To reduce the risk of electric shock, do not remove the cover. Refer servicing to qualified service personnel.

1) Unit produces non-ionizing radiation

2) Unit includes RFID

Unit includes WiFi

Classified with respect to electrical shock, fire, and mechanical hazards only in accordance with AAMI ES standard 60601-1; certified to CSA standard C22.2 60601-1:2008.

IP21 Liquid Ingress/Spillage Classification

On/Off

Restore Settings

Audio Volume

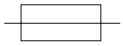
Service/Settings

High voltage

REM patient return electrode

Monopolar 1 Universal Foot-Pedal Port (UFP)

Ethernet



Fuse

Foot pedal

Volume adjustment for activation tones

Bipolar Menu button

Equipotential grounding point

Equipment should not be disposed in trash

Do not reuse (Single use only)

Standards and IEC Classifications

The VLFT10GEN meets all pertinent clauses of the IEC 60601-1 editions 2.0 and 3.1, IEC 60601-2-2 editions 4.0 and 5.0, IEC 60601-1-2 editions 2.1 and 3.0 and 4.0, and IEC 60601-1-8 edition 2.1.

Class I Equipment (IEC 60601-1)

Accessible conductive parts cannot become live in the event of a basic insulation failure because of the way in which they are connected to the protective earth conductor.

Type CF Equipment/Defibrillator Proof (IEC 60601-1, IEC 60601-2-2, and ANSI/AAMI HF18)

This VLFT10GEN provides a high degree of protection against electric shock, particularly regarding allowable leakage currents. It is type CF isolated (floating) output and may be used for procedures involving the heart.

IP21 Liquid Ingress/Spillage (IEC 60601-1 and IEC 60601-2-2)

The VLFT10GEN is constructed so that liquid spillage in normal use does not wet electrical insulation or other components which when wetted are likely to adversely affect the safety of the equipment.

Voltage Transients – Energy Platform Mains Transfer (IEC 60601-1, IEC 60601-2-2, and ANSI/AAMI HF18)

The VLFT10GEN continues to operate normally with no errors or system failures when transfer is made between line AC and an emergency system-voltage source. The system may momentarily shut down in a safe mode depending on the switchover time.

CISPR 11 Class A

The emissions characteristics of this equipment make it suitable for use in industrial areas and hospitals (CISPR 11 class A). If it is used in a residential environment (for which CISPR 11 class B is normally required), this equipment may not offer adequate protection to radio-frequency communication services. The user may need to take mitigation measures, such as relocating or re-orienting the equipment.

Important

RFID and WiFi function may be interfered with by other equipment even if that other equipment complies with CISPR emission requirements.

Electromagnetic Compatibility (IEC 60601-1-2 and IEC 60601-2-2)

The VLFT10GEN complies with the appropriate IEC 60601-1-2 and 60601-2-2 specifications regarding electromagnetic compatibility.

Notice

The VLFT10GEN requires special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in Chapter 4, *Technical Specifications*.

Portable and mobile RF communications equipment can affect the VLFT10GEN. Refer to the EMC information provided in Chapter 4, *Technical Specifications*.

The system should not be used adjacent to or stacked with equipment other than specified in the *Valleylab FT10 Energy Platform User Guide and Service Manual*. If adjacent or stacked use is necessary, the system should be observed to verify normal operation in the configuration in which it will be used.

Notice

The system intentionally applies RF energy for diagnosis or treatment during activation. Observe other electronic medical equipment in the vicinity during the system activation for any possible adverse electromagnetic effects. Ensure adequate separation of electronic medical equipment based on observed reactions.

The use of accessories, other than specified in the *Valleylab FT10 Energy Platform User Guide and Service Manual*, may result in increased emissions or decreased immunity of the system.

Guidance and manufacturer's declaration - electromagnetic emissions		
The Valleylab FT10 FT Series Energy Platform is intended for use in the electromagnetic environment specified below. The customer or the user of the Valleylab FT10 FT Series Energy Platform should assure that it is used in such an environment.		
Emissions test	**Compliance**	**Electromagnetic environment - guidance**
RF emissions CISPR 11	Group 2	The Valleylab FT10 FT Series Energy Platform must emit electromagnetic energy in order to perform its intended function. Nearby electronic equipment may be affected.
RF emissions CISPR 11	Class A	The Valleylab FT10 FT Series Energy Platform is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/flicker emissions IEC 61000-3-3	Complies	

The essential performance requirement per IEC60601-1 does not apply to VLFT10GEN. Basic safety is the performance requirement used during immunity testing.

Guidance and manufacturer's declaration - electromagnetic immunity			
The Valleylab FT10 FT Series Energy Platform is intended for use in the electromagnetic environment specified below. The customer or the user of the Valleylab FT10 FT Series Energy Platform should assure that it is used in such an environment.			
Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment - guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	± 8 kV contact ± 15 kV air	± 8 kV contact ± 15 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	± 2 kV for power supply lines ± 1 kV for input/ output lines	± 2 kV for power supply lines ± 1 kV for input/ output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC IEC 61000-4-5	± 1 kV differential mode ± 2 kV common mode	± 1 kV differential mode ± 2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	< 5% U_T (> 95% dip in U_T) for 0.5 cycle[a] < 40% U_T (> 60% dip in U_T) for 5 cycles < 70% U_T (> 30% dip in U_T) for 25 cycles < 5% U_T (> 95% dip in U_T) for 5 sec 0% U_T for 1 cycle	< 5% U_T (> 95% dip in U_T) for 0.5 cycle < 40% U_T (> 60% dip in U_T) for 5 cycles < 70% U_T (> 30% dip in U_T) for 25 cycles < 5% U_T (> 95% dip in U_T) for 5 sec 0% U_T for 1 cycle	Mains power quality should be that of a typical commercial or hospital environment.
Power frequency (50/ 60 Hz) magnetic field IEC 61000-4-8	30 A/m	30 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
a. 1 cycle is at 50 Hz or 20 ms **NOTE:** U_T is the a.c. mains voltage prior to the application of the test level.			

Guidance and manufacturer's declaration - electromagnetic immunity			
The Valleylab FT10 FT Series Energy Platform is intended for use in the electromagnetic environment specified below. The customer or the user of the Valleylab FT10 FT Series Energy Platform should assure that it is used in such an environment.			
Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment - guidance**
Conducted RF IEC 61000-4-6	3 V_{rms} 150 kHz to 80 MHz	3 V_{rms}	Portable and mobile RF communications equipment should be used no closer to any part of the Valleylab FT10 FT Series Energy Platform, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance:** d=1.2ÖP
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.7 GHz	3 V/m	d=1.2ÖP 80 MHz to 800 MHz d=2.3ÖP 800 MHz to 2.7 GHz Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey[a], should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol.
Continued			

Guidance and manufacturer's declaration - electromagnetic immunity
NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies. **NOTE 2** These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.
a. Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Valleylab FT10 FT Series Energy Platform is used exceeds the applicable RF compliance level above, the Valleylab FT10 FT Series Energy Platform should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the Valleylab FT10 FT Series Energy Platform. **b.** Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

Recommended separation distances between portable and mobile RF communication equipment and the Valleylab FT10 FT Series Energy Platform

The VLFT10GEN is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the system can help prevent electromagnetic interferences by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the system as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter (W)	**Separation distance according to frequency of transmitter (m)**		
	150 kHz to 80 MHz d=1.2 x ÖP	**80 MHz to 800 MHz d=1.2 x ÖP**	**800 MHz to 2.5 GHz d=2.7 x ÖP**
0.01	0.12	0.12[a]	0.23[a]
0.1	0.37	0.37	0.74
1	1.2	1.2	2.3
10	3.7	3.7	7.4
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

a. For frequencies listed in the following table, use a separation distance of 0.3 m.

Continued

Recommended separation distances between portable and mobile RF communication equipment and the Valleylab FT10 FT Series Energy Platform			
Frequency ranges and text condition on transmitter bands			
Bands (MHz)	**Test Frequencies (MHz)**	**Modulation**	**Claimed Compliance Level V/m**
380 – 390	385	Pulse[a] – 18 Hz	27
430 – 470	450	FM ± 5 kHz Deviation or Pulse[a] – 18 Hz	28
704 – 787	710, 745, 780	Pulse[a] – 217 Hz	9
800 – 960	810, 870, 930	Pulse[a] – 18 Hz	28
1700 – 1990	1720, 1845, 1970	Pulse[a] – 217 Hz	28
2400 – 2570	2450	Pulse[a] – 217 Hz	28
5100 – 5800	5240, 5500, 5785	Pulse[a] – 217 Hz	9

a. Pulse Modulation is defined as a square wave input with a 50% duty cycle at the listed frequency.

NOTE 1 The minimum dwell time during test is 7 s.

NOTE 2 A minimum separation distance of 0.3 meters should be maintained between any device transmitting in this band and the VLFT10GEN. This includes devices such as mobile phones, PDAs, Wireless LANs, RFID and Bluetooth™*.

Cables Used for EMC Compliance Testing

The following cables, lengths, and instruments were used to determine compliance levels.

Model No.	Description	Shielded	Length	Location	Classification	Tests Included
207002060	A/C cable	No	15 ft. (4.6 m)	Rear panel	AC	Emissions/ Immunity
1017178	Equipotential cable	No	15 ft. (4.6 m)	Rear panel	EQ	Emissions/ Immunity
E2450HDB	2-button pencil	No	15 ft. (4.6 m)	Front panel Mono 1	Patient	Emissions/ Immunity
FT3000DB	Force TriVerse pencil	No	15 ft. (4.6 m)	Front panel Mono 2	Patient	Emissions/ Immunity
Continued						

Model No.	Description	Shielded	Length	Location	Classification	Tests Included
E7507DB	Adult REM pad	No	15 ft. (4.6 m)	Front panel REM	Patient	Emissions/ Immunity
E0020V/ E4073CT	Foot switching bipolar cord/ bayonet forceps	No	15 ft. (4.6 m)	Front panel bipolar	Patient	Emissions/ Immunity
LF1644	LigaSure	No	10 ft. (3 m)	Front panel LigaSure	Patient	Immunity
FT0021S/ FT27050SL	Cord Storz/ Storz Resectoscope	No	15 ft. (4.6 m)/ NA	Front panel Adv. Energy	Patient	Emissions
E6008B	Monopolar footswitch	No	15 ft. (4.6 m)	Rear panel Mono 1	SIP/SOP	Emissions/ Immunity
E6019	Dome Bipolar footswitch	No	15 ft. (4.6 m)	Rear panel bipolar	SIP/SOP	Emissions/ Immunity
LS0300	LigaSure footswitch	No	15 ft. (4.6 m)	Rear panel LigaSure	SIP/SOP	Emissions/ Immunity
Any	Ethernet	No	15 ft. (4.6 m) min.	Rear panel	SIP/SOP	Emissions/ Immunity
SEA3730	Coax	No	10 ft. (3 m)	Rear panel smoke evac.	SIP/SOP	Emissions/ Immunity
SEA3730	Coax	No	10 ft. (3 m)	Rear panel ECG blank	SIP/SOP	Emissions/ Immunity

Return Electrode Monitor (REM)

REM Specification	
Interrogation Frequency	64–76 kHz
Interrogation Current	< 100 µA
Contact Resistance Sense Range	5 Ω to 135 Ω
Contact Resistance Accuracy (RF not activated)	± 7 Ω
Contact Resistance Accuracy (RF Activated)	Greater of ± 14 Ω or 20%

REM Alarm Activation

REM patient return electrode: When the measured resistance exceeds the standard range of safe resistance (below 5 ohms or above 135 ohms) or when the measured contact resistance increases by 40% over the baseline, the REM alarm is activated and RF output is disabled.

Auto Bipolar

The VLFT10GEN is equipped with an Auto Bipolar feature that allows for automatic activation of bipolar energy.

Warning

Use of different Covidien cord models or cords from other manufacturers may not achieve proper electrical output for this device, thereby failing to produce the desired clinical effect. For example, Auto Bipolar activation/deactivation settings may not work properly using cords other than those specified by Covidien.

In the Auto Bipolar setting, activation may occur with contact of any material. When not in use, place electrosurgical instruments in a safety holster or safely away from patients, the surgical team, and flammable materials

Auto Bipolar Specifications	
Interrogation Frequency	434 kHz ± 10%
Interrogation Current	< 10 μA_{RMS} averaged over 1 second
Activation Impedance	≤ 2200 Ω ± 20%
Deactivation Impedance	> 4000 Ω ± 20%
Keying Delay	User selectable in 0.5 second increments from 0 sec. to 2.5 sec.
Minimum Power	1 W

Audio Tones

Activation Tones

Activation Tones	Tone	Duration	Volume
CUT	660 Hz ± 5%	Entire Activation Duration	User adjustable from 45 dBA to 65 dBA (-0/+6 dBA @ 1 m)
COAG	940 Hz ± 5%	Entire Activation Duration	
SHARED COAG	988 Hz ± 5%	Entire Activation Duration	
VALLEYLAB	800 Hz ± 5%	Entire Activation Duration	
BIPOLAR	940 Hz ± 5%	Entire Activation Duration	
LIGASURE	440 Hz ± 5%	Entire Activation Duration	

Alarm Tones

Alarm Tones	Tone(s)	Duration	Volume
REM	660 Hz ± 5%	Two 500 msec. tones separated by 500 msec. of silence	65 dBA (-0/+6 dBA @ 1 m)
Incomplete Seal Cycle (Regrasp/ Reactivate)	High 784 Hz ± 5% Low 587 Hz ± 5%	Four 175 msec. tones (high, low, high, low)	
Seal Cycle Complete	988 Hz ± 5%	Two 175 msec. tones separated by 175 msec. of silence	
High System Alarm	Simultaneously play the following tones: 784 Hz ± 5% 1568Hz ± 5% 2352 Hz ± 5% 3136 Hz ± 5%	Ten 138 msec. tones separated by 88, 88, 312, 88, 825, 88, 88, 312, and 88 msec. of silence	
Medium System Alarm	Simultaneously play the following tones: 784 Hz ± 5% 1568Hz ± 5% 2352 Hz ± 5% 3136 Hz ± 5%	Three 188 msec. tones separated 188 msec. of silence	
Low System Alarm	Simultaneously play the following tones: 784 Hz ± 5% 1568Hz ± 5% 2352 Hz ± 5% 3136 Hz ± 5%	One 188 msec. tone	

Alarm Tones	Tone(s)	Duration	Volume
Informational Alarm	Simultaneously play the following tones: 784 Hz ± 5% 1568Hz ± 5% 2352 Hz ± 5% 3136 Hz ± 5%	One 188 msec. tone	User adjustable from 45 dBA to 65 dBA (-0/+6 dBA @ 1 m)

Notice
Alarm characteristics cannot be changed.
Alarm response time is less than one second.

Energy Output Characteristics

The VLFT10GEN automatically senses the tissue resistance and adjusts the output voltage to maintain a consistent effect across different tissue density. The adjustment is based on the selected mode or effect, power setting, and the level of tissue resistance. The maximum output voltage is controlled to reduce capacitive coupling and video interference and to minimize undesired sparking. The following table outlines the rated power, peak voltages, and maximum output current for a given modality. The peak voltage includes tolerance and identifies the maximum value across all loading conditions. Output power can vary ± 15%. Current nominal maximum does not include tolerance.

	Rated Load (Ω)	Rated Output Power (W)	Peak Voltage (V)[1]	Current Nominal Max (A)	Typical Crest Factor[2]	Duty Cycle
Monopolar CUT						
PURE	300	300	1287	1.25	1.6	100%
BLEND	300	200	2178	1.0	2.2	50%
Valleylab						
VALLEYLAB	300	200	2783	1.0	3.2	25%
Monopolar COAG						
SOFT	100	120	264	1.55	1.5	100%
FULGURATE	500	120	3448	1.0	5.4	6.25%
SHARED FULGURATE	500[4]	120	3448	1.0	5.4	6.25%
SPRAY	500	120	3932	1.0	6.2	4.76%
SHARED SPRAY	500[4]	120	3932	1.0	6.2	4.76%
Bipolar						
LOW (1–15 W)	100	15	133	1.0	1.8	100%
MEDIUM (16–40 W)	100	40	214	2.0	1.8	100%
HIGH (45–95 W)	100	95	462	2.0	1.7	100%
LigaSure						
LIGASURE	20	350	244	5.5	1.9	100%
Bipolar Resection						
• CUT	500	200[3]	742	2.4	1.4	100%
• COAG	100	175	318	3.2	1.6	100%

1. Per IEC 60601-2-2: 2009 clause 201.7.9.2.2.101(c)(2), whenever the peak voltage is greater than 1600 V, the calculated variable y is less than the actual crest factor. The peak voltage at rated load can be calculated using the equation:
$V_{peak}(U_{max})$ = TypicalCrestFactor $\sqrt{\text{Power} \cdot \text{RatedLoad}}$

2. At rated load.

3. Bipolar Resection CUT maximum power is 432 W, including tolerance.

4. Rated load in SHARED COAG modes is the total energy channel load. For SHARED dual activation using two activating instruments, it is the parallel combination of the two loads. For SHARED single activation using one activating instrument, it is the load connected to the activating electrode only.

Output Waveforms

TissueFect Tissue Sensing Technology, an automatic adjustment, controls all modes and effects. As tissue resistance increases from zero, the energy platform outputs constant current, followed by constant power, followed by constant voltage. The maximum output voltage is controlled to reduce capacitive coupling and video interference and to minimize sparking.

Bipolar

LOW	434 kHz ±10% continuous sinusoid
MEDIUM	434 kHz ±10% continuous sinusoid
HIGH	434 kHz ±10% continuous sinusoid

Monopolar CUT

CUT	434 kHz ±10% continuous sinusoid
BLEND	434 kHz ±10% bursts of sinusoid, recurring at 27.13 kHz ±10% intervals 50% duty cycle

VALLEYLAB

VALLEYLAB	434 kHz ±10% bursts of sinusoid, recurring at 27.13 kHz ±10% intervals 25% duty cycle

Monopolar COAG

SOFT	434 kHz ±10% continuous sinusoid
FULGURATE	434 kHz ±10% damped sinusoidal bursts with a repetition frequency of 27.13 kHz ±10% 6.25% duty cycle
SHARED FULGURATE	434 kHz ±10% damped sinusoidal bursts with a repetition frequency of 27.13 kHz ±10% 6.25% duty cycle
SPRAY	434 kHz ±10% damped sinusoidal bursts with a repetition frequency of 20.67 kHz ±10% 4.76% duty cycle
SHARED SPRAY	434 kHz ±10% damped sinusoidal bursts with a repetition frequency of 20.67 kHz ±10% 4.76% duty cycle

LigaSure

LIGASURE	434 kHz ±10% continuous sinusoid

Bipolar Resection

BIPOLAR RESECTION	434 kHz ±10% continuous sinusoid

Output Power vs. Resistance Graphs

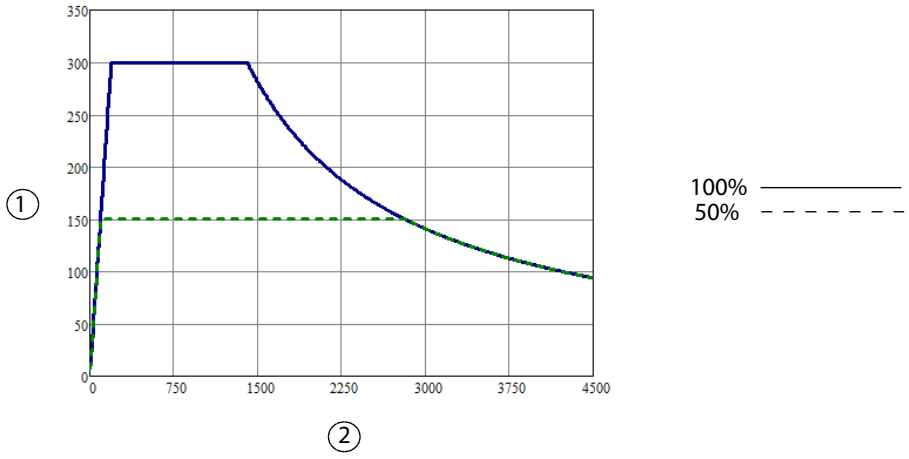
For the values stated in the graphs provided in this section:

- Output power at rated load is within the greater of 15% or 8 W.
- Peak voltage includes tolerances.
- The generator measures resistance within the greater of 15% or 5 Ω.
- Output power is measured using compatible instruments, not test leads.

Monopolar Graphs

PURE CUT

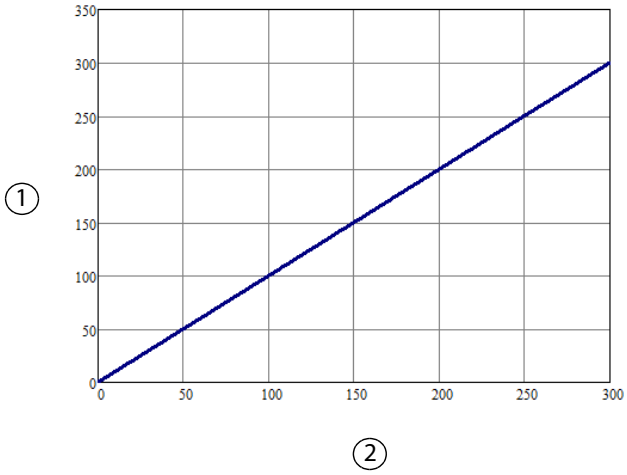
Output power versus resistance for Pure CUT power



① Output power (watts)

② Load resistance (ohms)

Output power versus power setting for Pure CUT power

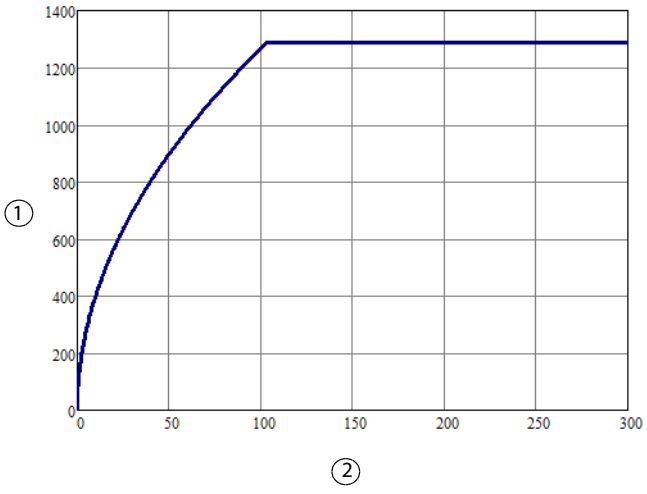


① Output power (watts)

② Power setting

Note: Rated load

Peak voltage versus power setting for Pure CUT power



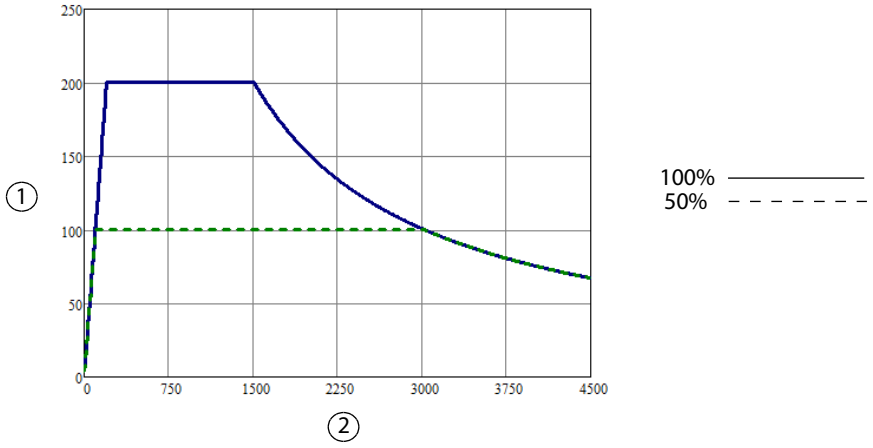
① Peak voltage (volts)

② Power setting

Note: Open circuit

BLEND

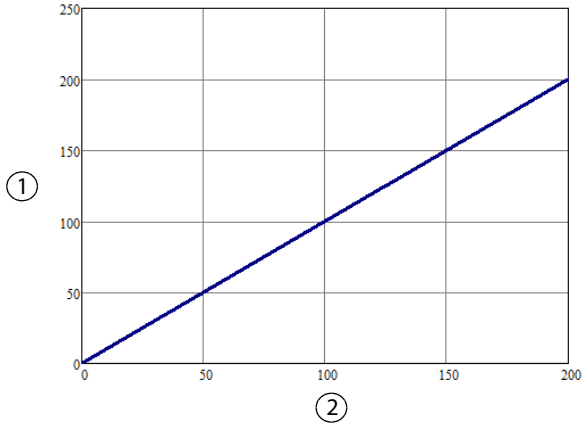
Output power versus resistance for BLEND power



① Output power (watts)

② Load resistance (ohms)

Output power versus power setting for BLEND power

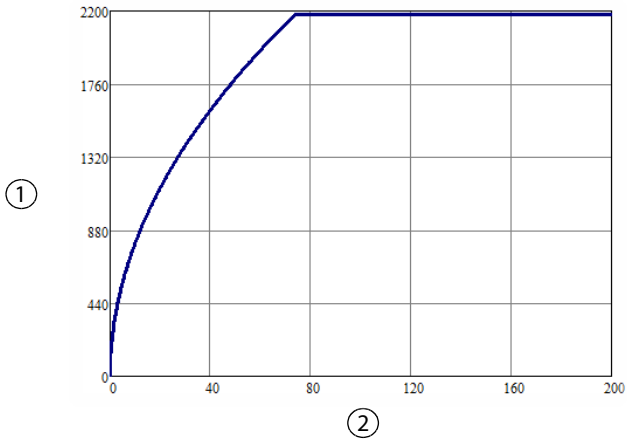


① Output power (watts)

② Power setting

Note: Rated load

Peak voltage versus power setting for BLEND power



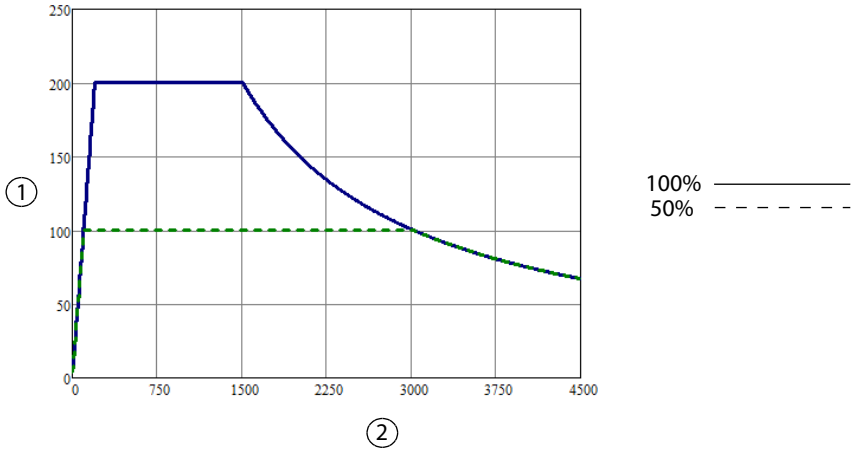
① Peak voltage (volts)

② Power setting

Note: Open circuit

VALLEYLAB

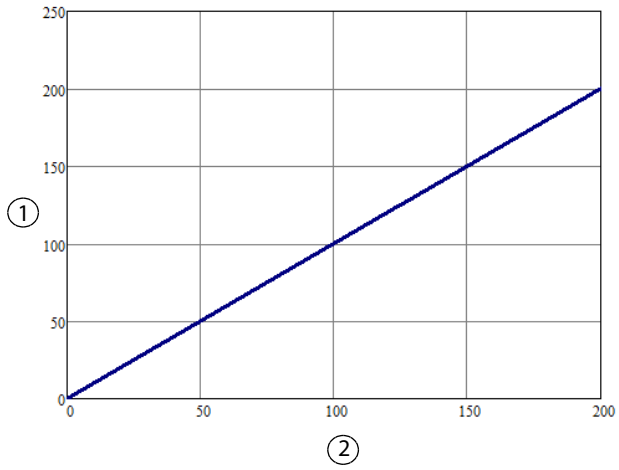
Output power versus resistance for VALLEYLAB power



① Output power (watts)

② Load resistance (ohms)

Output power versus power setting for VALLEYLAB power

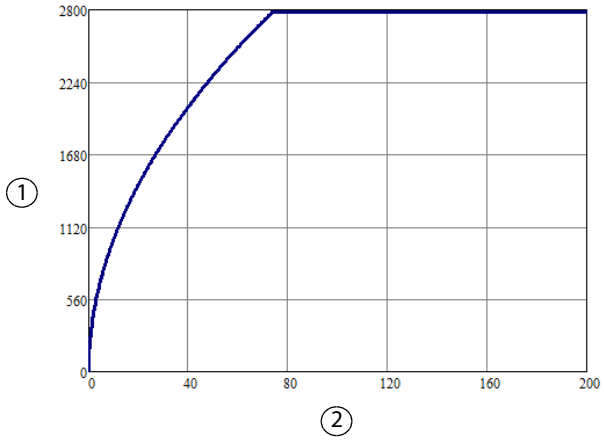


① Output power (watts)

② Power setting

Note: Rated load

Peak voltage versus power setting for VALLEYLAB power



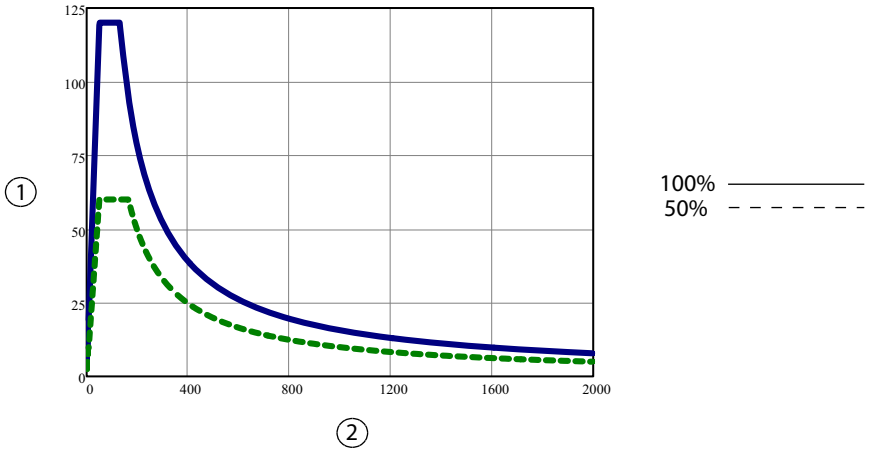
① Peak voltage (volts)

② Power setting

Note: Open circuit

SOFT COAG

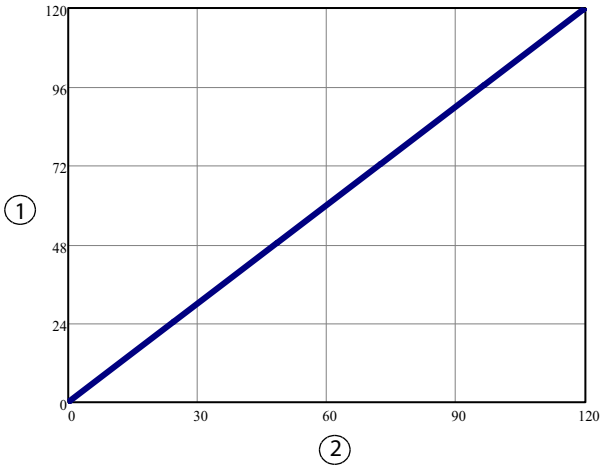
Output power versus resistance for SOFT COAG power



① Output power (watts)

② Load resistance (ohms)

Output power versus power setting for SOFT COAG power

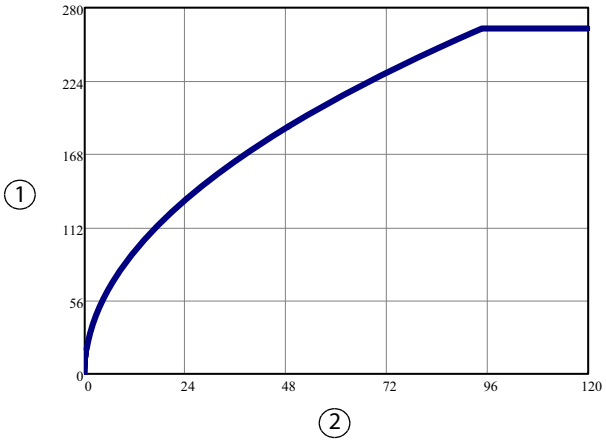


① Output power (watts)

② Power setting

Note: Rated load

Peak voltage versus power setting for SOFT COAG power



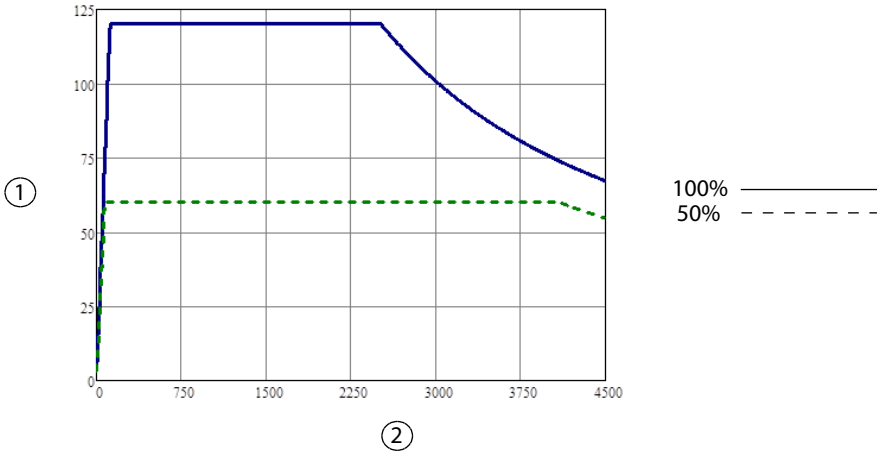
① Peak voltage (volts)

② Power setting

Note: Open circuit

FULGURATE

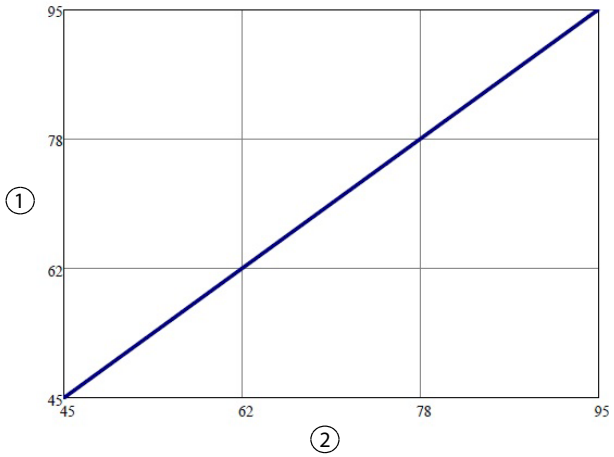
Output power versus resistance for FULGURATE power



① Output power (watts)

② Load resistance (ohms)

Output power versus power setting for FULGURATE power

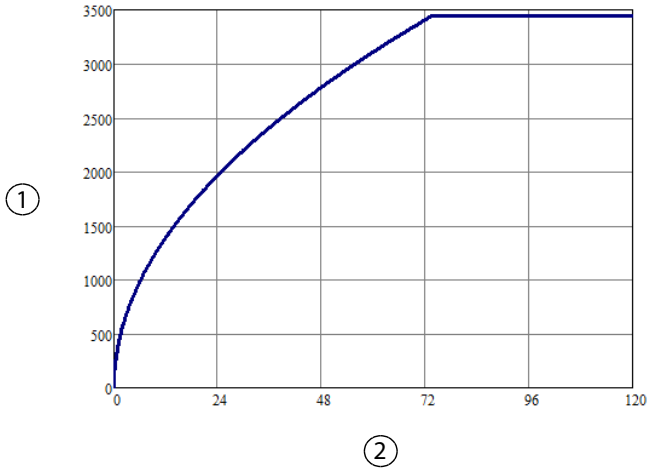


① Output power (watts)

② Power setting

Note: Rated load

Peak voltage versus power setting for FULGURATE power



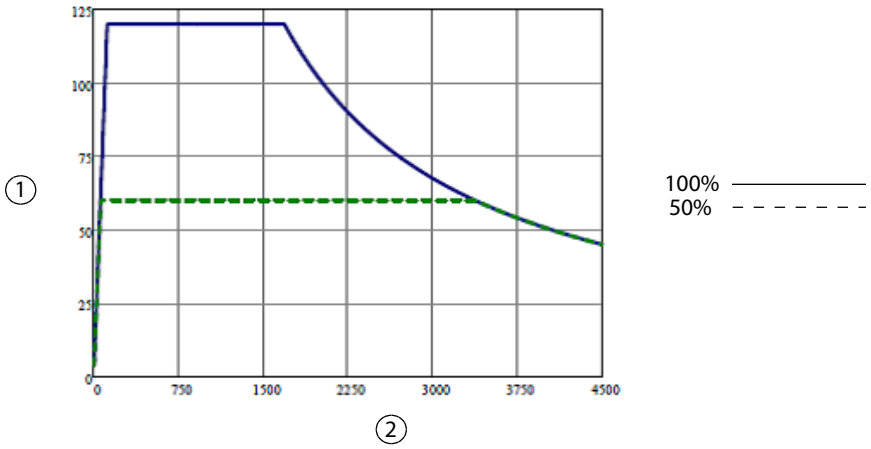
① Peak voltage (volts)

② Power setting

Note: Open circuit

SHARED FULGURATE - Single Activation (One Instrument Activated)

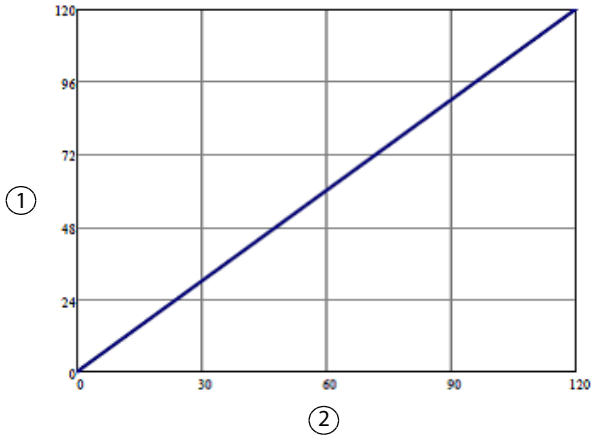
Output power versus resistance for SHARED FULFURATE (single activation) power



① Output power (watts)

② Load resistance (ohms)

Output power versus power setting for SHARED FULGURATE (single activation) power

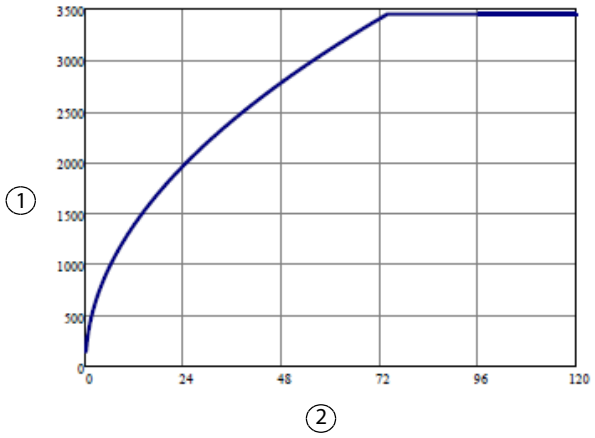


① Output power (watts)

② Power setting

Note: Rated load

Peak voltage versus power setting for SHARED FULGRUATE (single activation) power



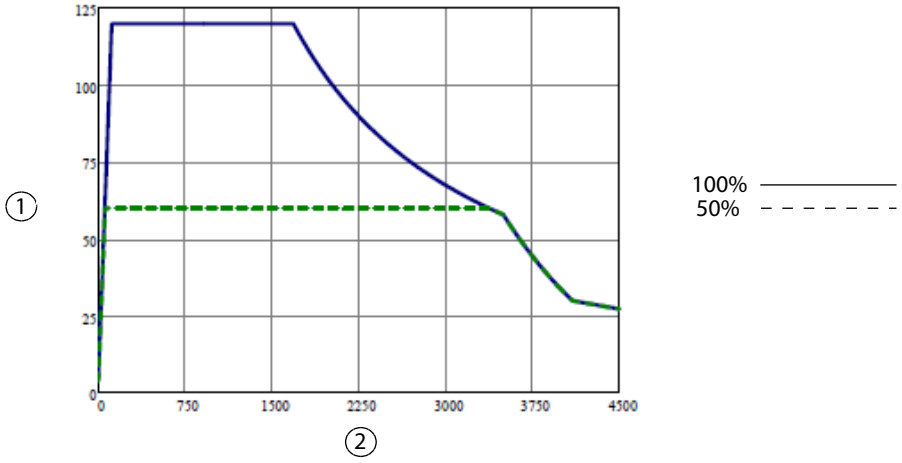
① Peak voltage (volts)

② Power setting

Note: Open circuit

SHARED FULGURATE - Dual Activation (Two Instruments Activated)

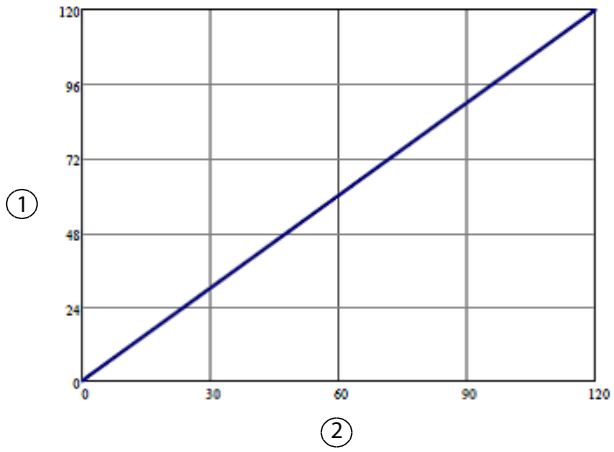
Output power versus resistance for SHARED FULFURATE (dual activation) power



① Output power (watts)

② Load resistance (ohms)

Output power versus power setting for SHARED FULGURATE (dual activation) power

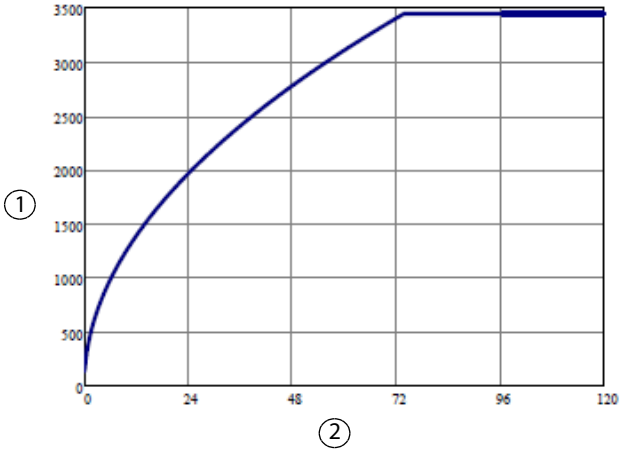


① Output power (watts)

② Power setting

Note: Rated load

Peak voltage versus power setting for SHARED FULGRUATE (dual activation) power



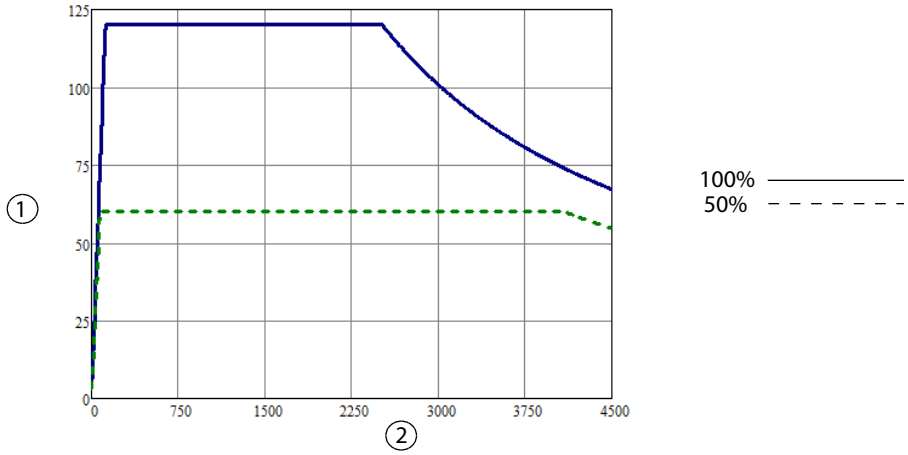
① Peak voltage (volts)

② Power setting

Note: Open circuit

SPRAY

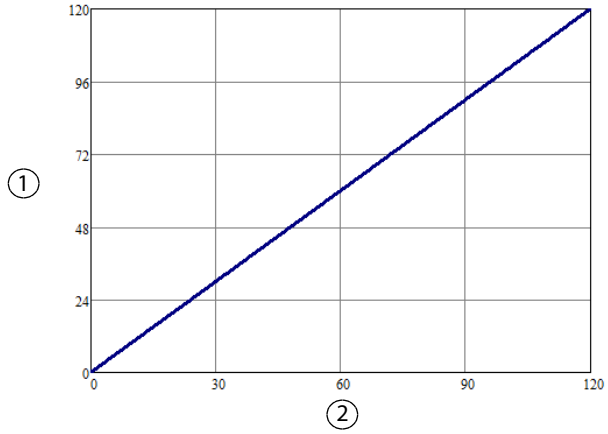
Output power versus resistance for SPRAY power



① Output power (watts)

② Load resistance (ohms)

Output power versus power setting for SPRAY power

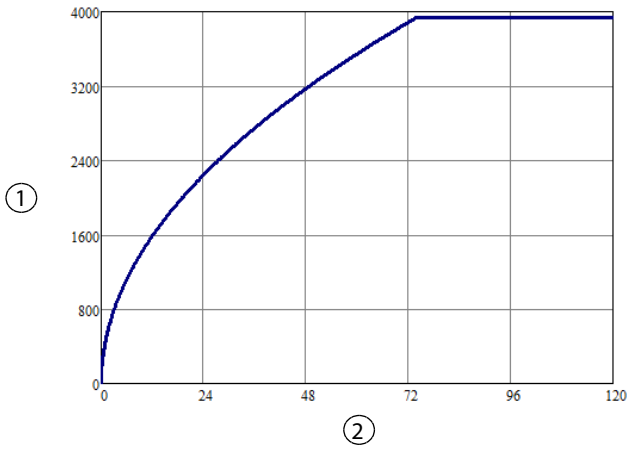


① Output power (watts)

② Power setting

Note: Rated load

Peak voltage versus power setting for SPRAY power



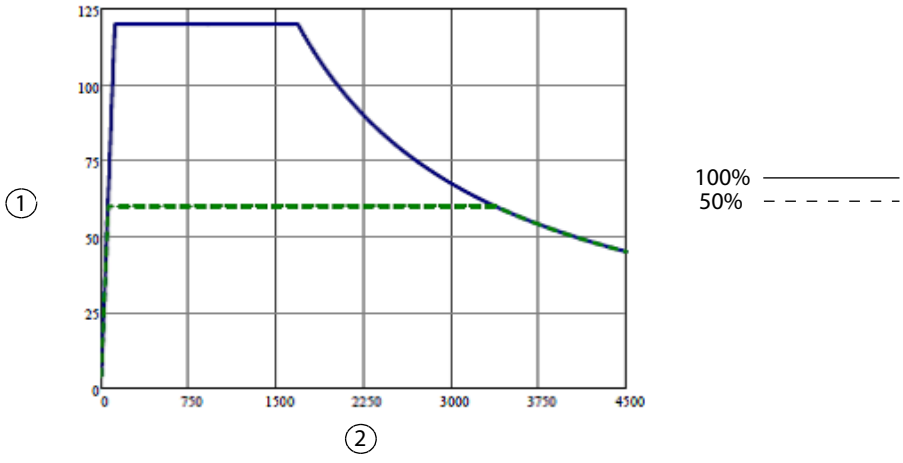
① Peak voltage (volts)

② Power setting

Note: Open circuit

SHARED SPRAY - Single Activation (One Instrument Activated)

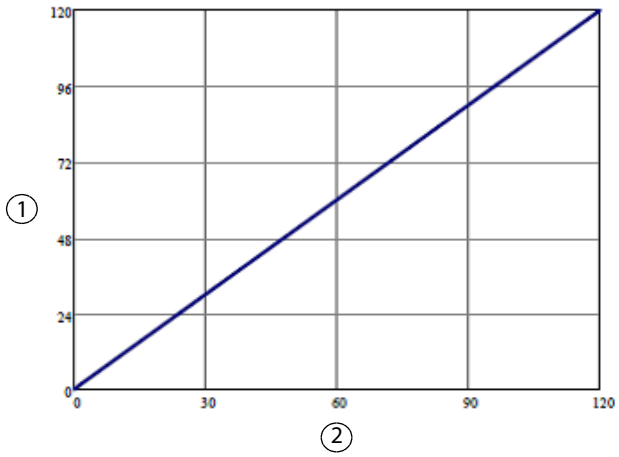
Output power versus resistance for SHARED SPRAY (single activation) power



① Output power (watts)

② Load resistance (ohms)

Output power versus power setting for SHARED SPRAY (single activation) power

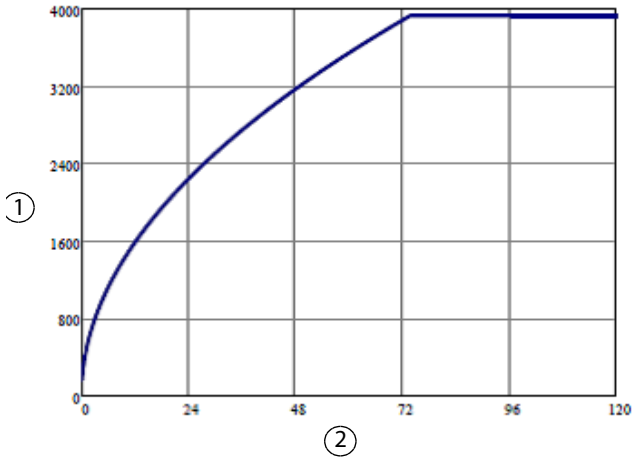


① Output power (watts)

② Power setting

Note: Rated load

Peak voltage versus power setting for SHARED SPRAY (single activation) power



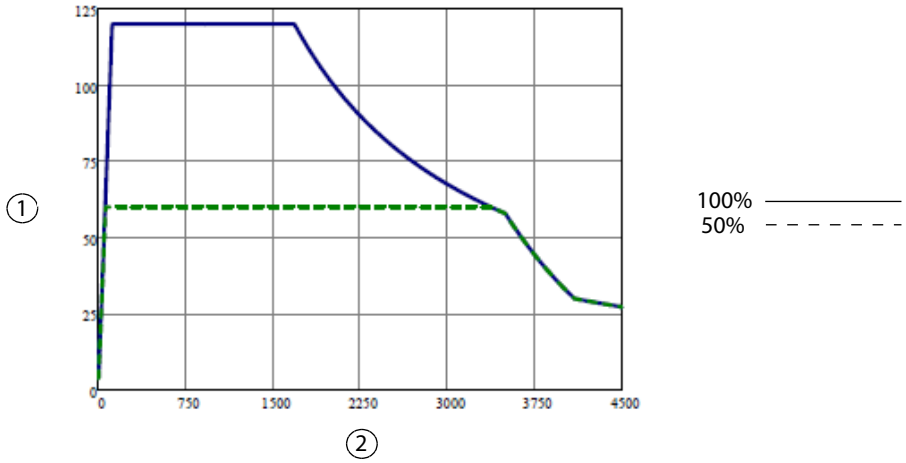
① Peak voltage (volts)

② Power setting

Note: Open circuit

SHARED SPRAY - Dual Activation (Two Instruments Activated)

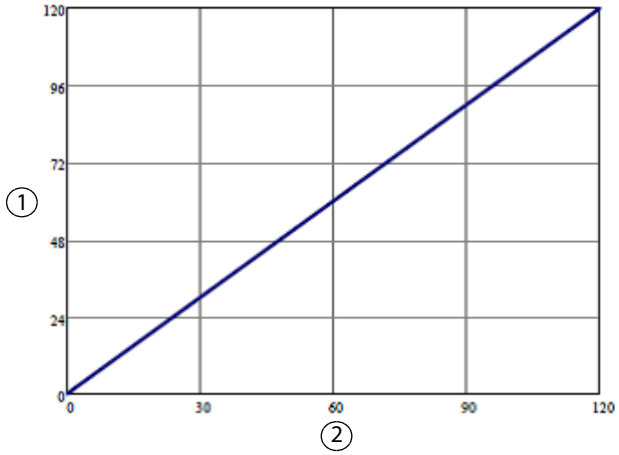
Output power versus resistance for SHARED SPRAY (dual activation) power



① Output power (watts)

② Load resistance (ohms)

Output power versus power setting for SHARED SPRAY (dual activation) power

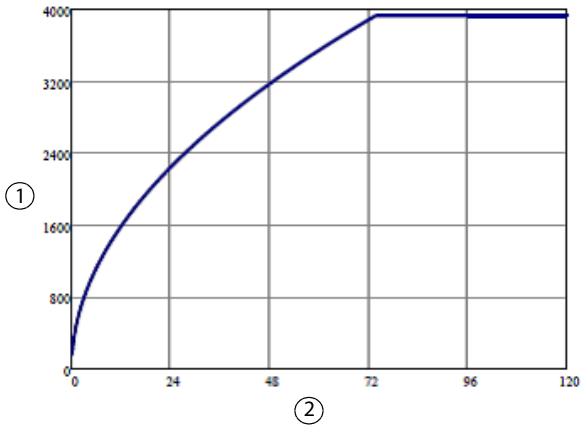


① Output power (watts)

② Power setting

Note: Rated load

Peak voltage versus power setting for SHARED SPRAY (dual activation) power



① Peak voltage (volts)

② Power setting

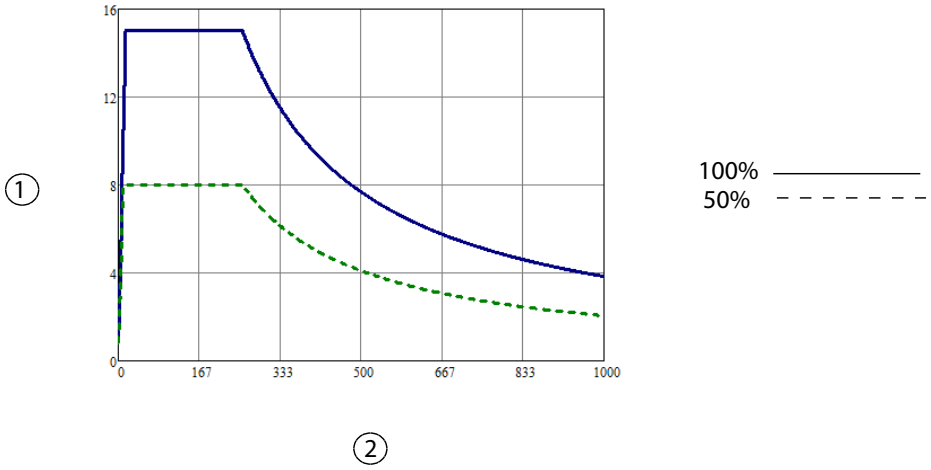
Note: Open circuit

Bipolar Graphs

Bipolar LOW Effect

Note: Bipolar LOW effect is utilized for power settings of OFF, 1-15 W inclusive within Bipolar mode (1-95 W).

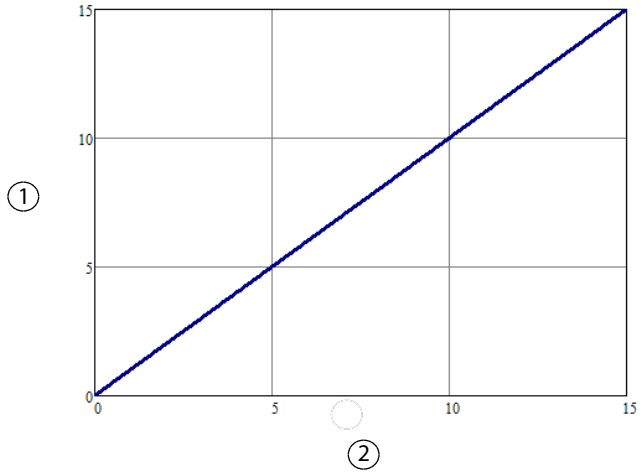
Output power versus resistance for Bipolar LOW power



① Output power (watts)

② Load resistance (ohms)

Output power versus power setting for Bipolar LOW power

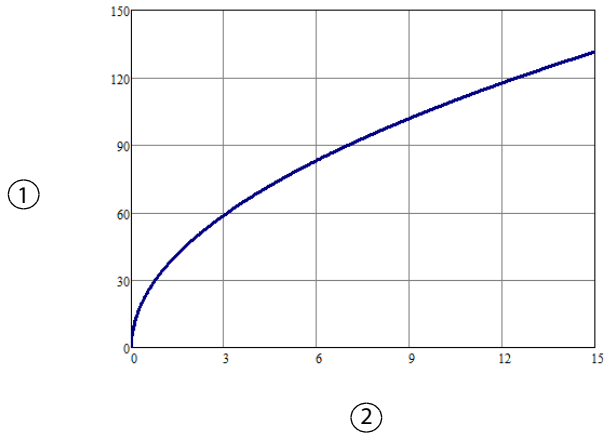


① Output power (watts)

② Power setting

Note: Rated load

Peak voltage versus power setting for Bipolar LOW power



① Peak voltage (volts)

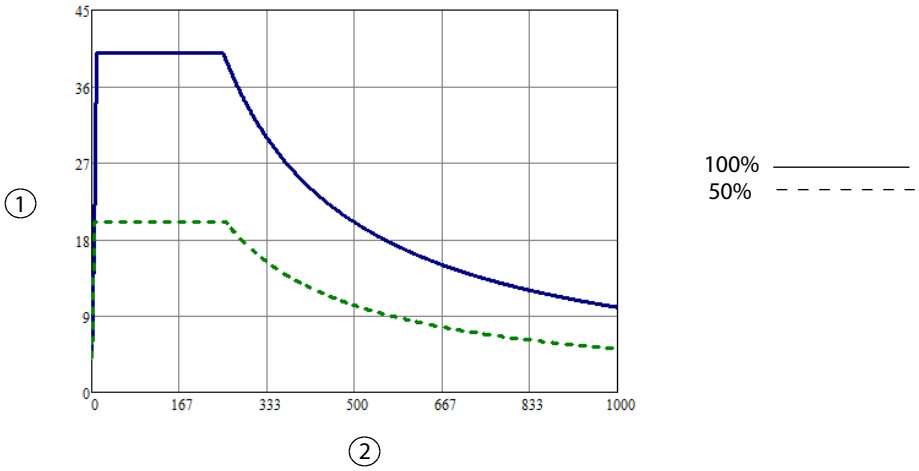
② Power setting

Note: Open circuit

Bipolar MEDIUM Effect

Note: Bipolar MEDIUM effect is utilized for power settings of 16–40 W inclusive within Bipolar mode (1-95 W).

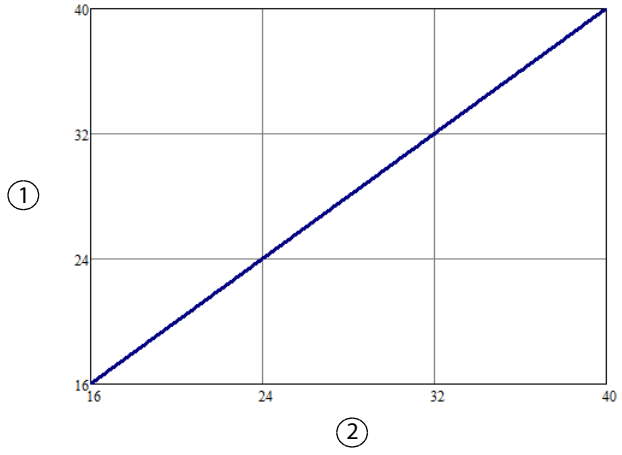
Output power versus resistance for Bipolar MEDIUM power



① Output power (watts)

② Load resistance (ohms)

Output power versus power setting for Bipolar MEDIUM power

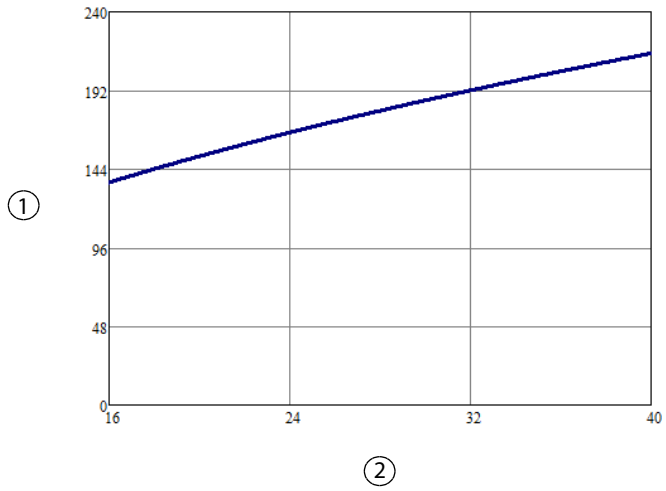


① Output power (watts)

② Power setting

Note: Rated load

Peak voltage versus power setting for Bipolar MEDIUM power



① Peak voltage (volts)

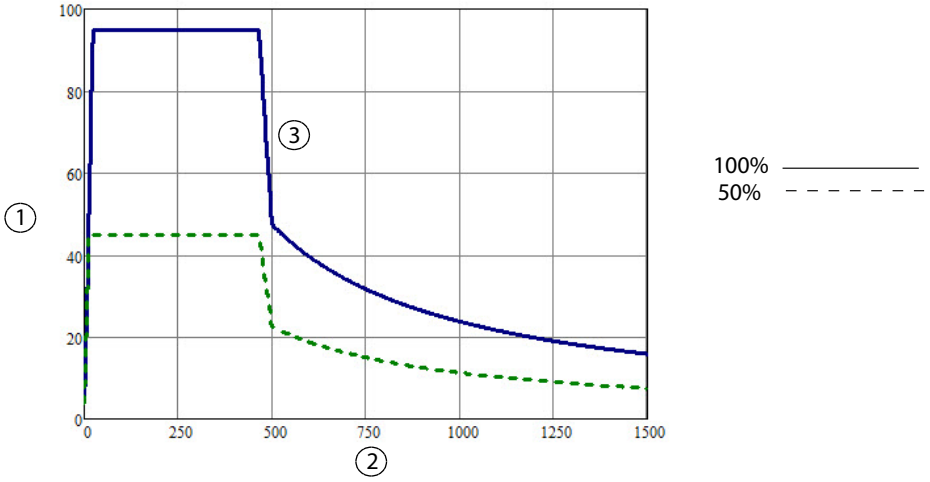
② Power setting

Note: Open circuit

Bipolar HIGH Effect

Note: Bipolar HIGH Effect is utilized for power settings of 45–95 W inclusive within Bipolar mode (1-95 W).

Output power versus resistance for Bipolar HIGH power

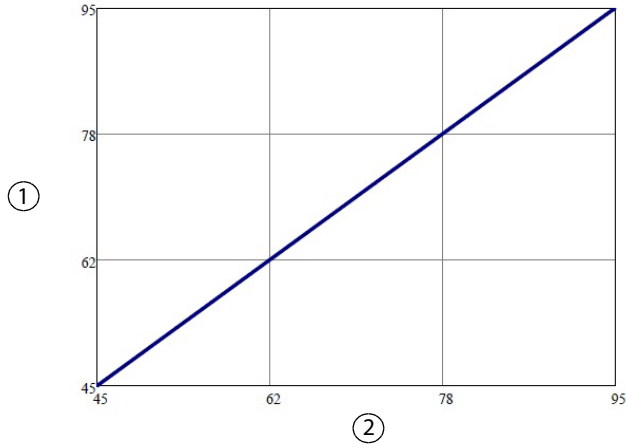


① Output power (watts)

② Load resistance (ohms)

③ See *Discontinuous Power Curves* on page 4-49 for additional details of this region of the power curve.

Output power versus power setting for Bipolar HIGH power

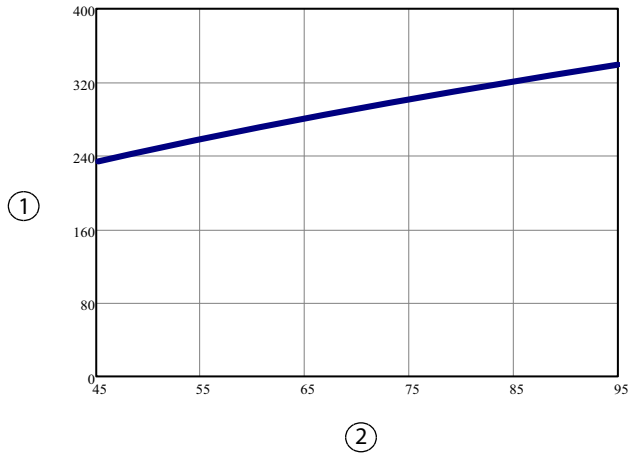


① Output power (watts)

② Power setting

Note: Rated load

Peak voltage versus power setting for Bipolar HIGH power



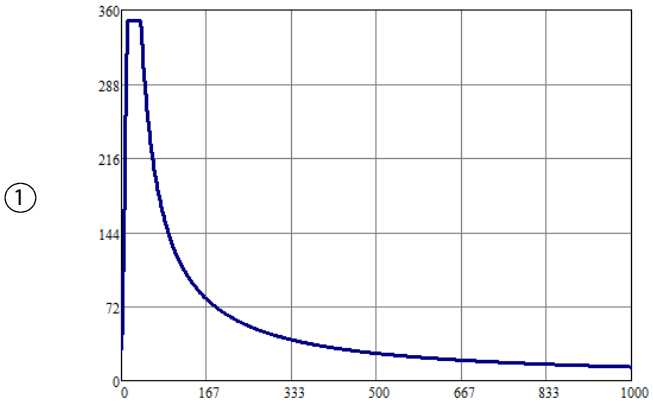
① Peak voltage (volts)

② Power setting

Note: Open circuit

LigaSure

Output power versus resistance for LigaSure power

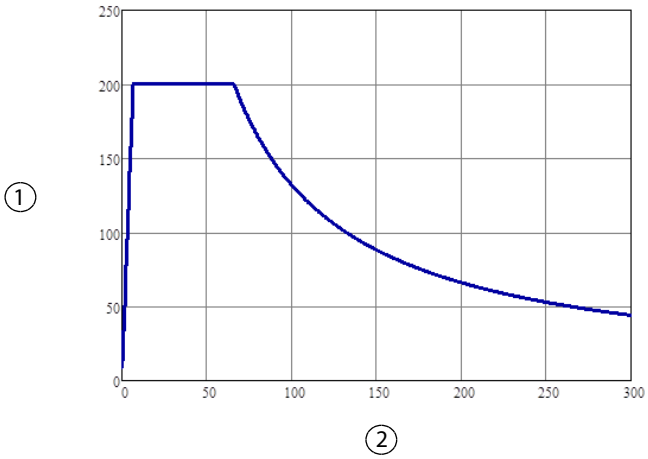


① Output power (watts)

② Load resistance (ohms)

Note: The LigaSure Vessel Sealing algorithm is a vessel adaptive algorithm. The LigaSure Vessel Sealing algorithm only requests the power it needs to optimally seal vessels; the power requested will be within the confines of the output power capability curve. Presentation of the "half output control setting" per IEC 60601-2-2 is not required.

Output power versus resistance for representative LigaSure instruments

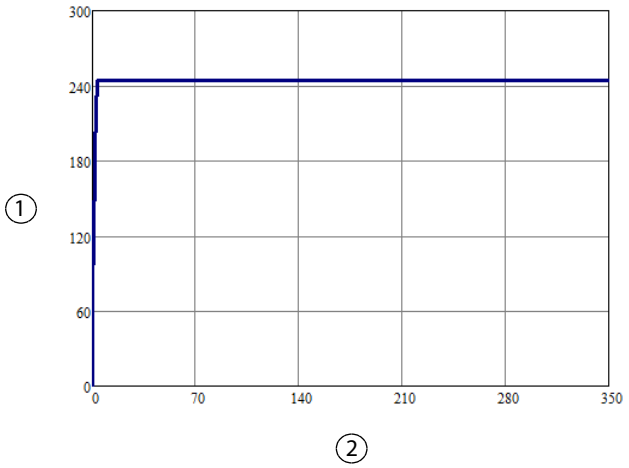


① Output power (watts)

② Load resistance (ohms)

Note: The LigaSure algorithm limits the power to 200 watts for the representative LigaSure instruments including LF1537, LF1544, LF5544, LF1212, LF1212A, LF4200, LF4200T, LF1520, LF1723, LF1737, LF1744, LF1637, LF1623, LF1644, LF3225, LS1020, LS1037, LF4318, LF5637, and LF5644.

Peak voltage versus output power for LigaSure power



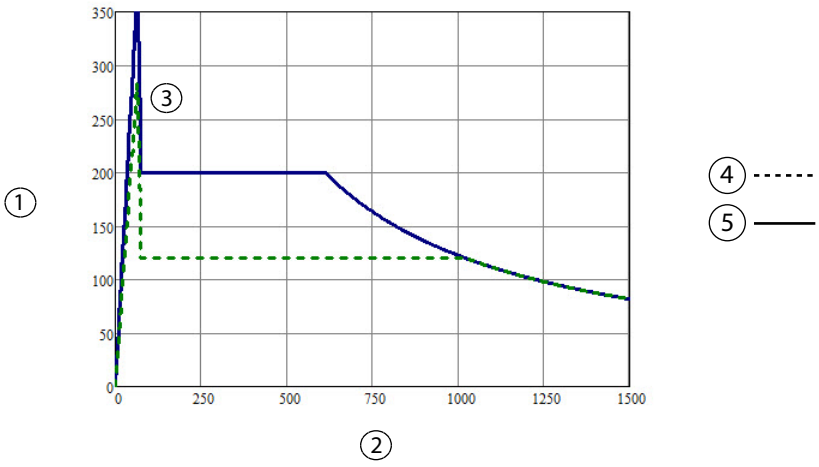
① Peak voltage (volts)

② Output power (watts)

Note: Open circuit

Bipolar Resection CUT

Output power versus resistance for Bipolar Resection CUT effect setting



① Output power (watts)

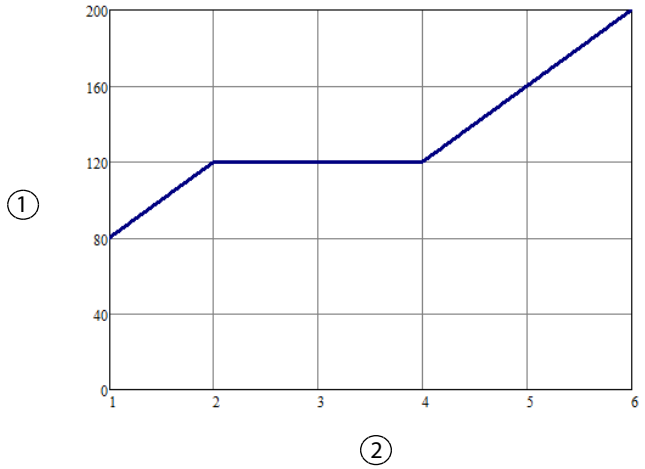
② Load resistance (ohms)

③ See *Discontinuous Power Curves* on page 4-49 for additional details of this region of the power curve.

④ CUT Effect 3

⑤ CUT Effect 6

Output power versus effect setting for Bipolar Resection CUT

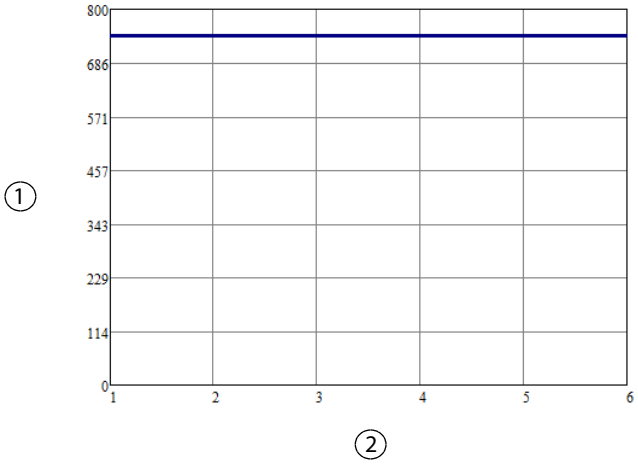


① Output power (watts)

② Effect setting

Note: Rated load

Peak voltage versus effect setting for Bipolar Resection CUT



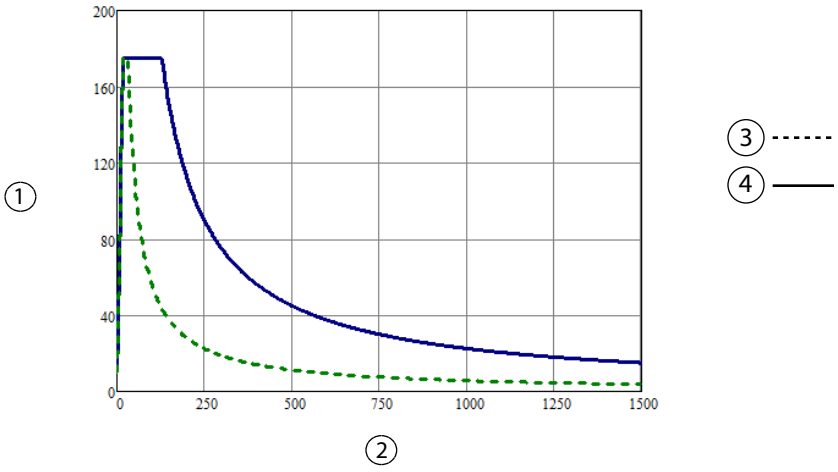
① Peak voltage (volts)

② Effect setting

Note: Open circuit

Bipolar Resection COAG

Output power versus resistance for Bipolar Resection COAG effect setting



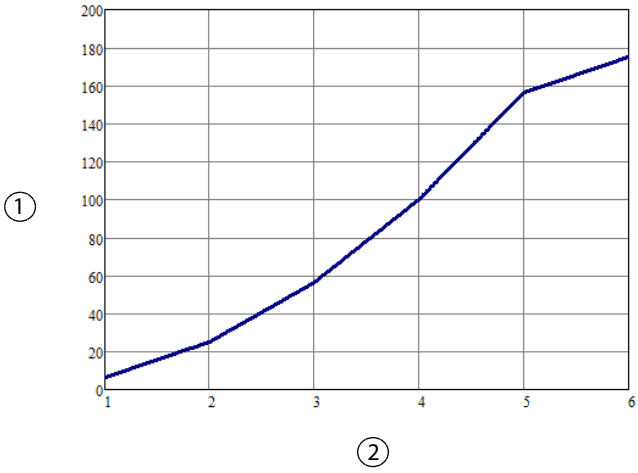
① Output power (watts)

② Load resistance (ohms)

③ COAG Effect 3

④ COAG Effect 6

Output power versus effect setting for Bipolar Resection COAG

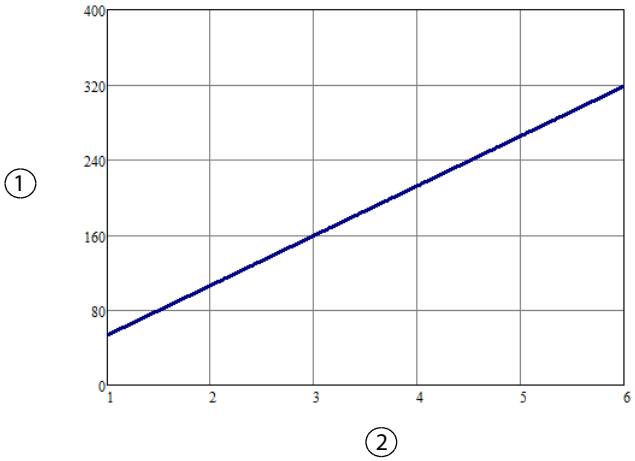


① Output power (watts)

② Effect setting

Note: Rated load

Peak voltage versus effect setting for Bipolar Resection COAG



① Peak voltage (volts)

② Effect setting

Note: Open circuit

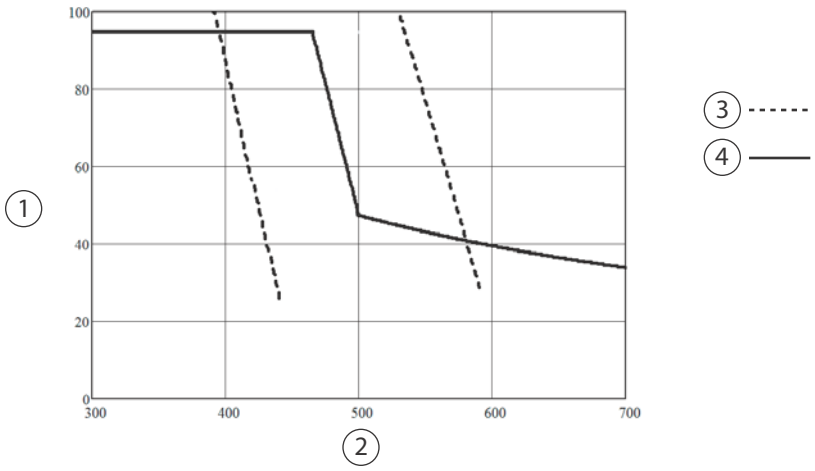
Discontinuous Power Curves

The power curves depicted earlier in this section show a nominal situation – one where there is no sensor variance. As stated earlier in this section, there is an allowed tolerance in both the output power as well as the measured resistance, so any measurements that fall within the allowed tolerance, or "area of uncertainty," are considered to meet requirements.

For most regions of the power curve, considering only the tolerance in power is an acceptable engineering approximation; however, in some modes there are regions in the power curves with sharp changes in output power with respect to measured resistance. In these power curve regions, the area of uncertainty in resistance should be considered when performing power output tests.

The following charts zoom in on the sharp changes in the power curves and provide an illustrative description of the area of uncertainty in resistance along just that portion of the power curve.

Bipolar HIGH Effect: Output Power vs. Resistance (Full Power) with Area of Uncertainty in Resistance (does not include power tolerance)



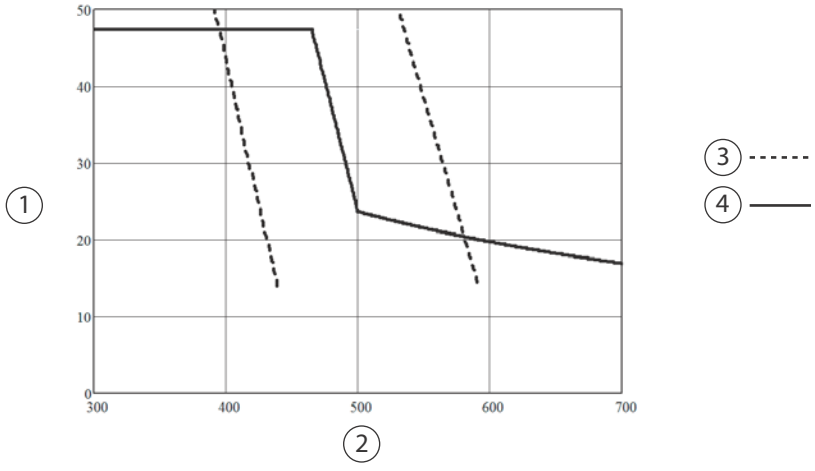
① Output power (watts)

② Load resistance (ohms)

③ Area of uncertainty in resistance

④ Nominal power curve

Bipolar HIGH Effect: Output Power vs. Resistance (Half Power) with Area of Uncertainty in Resistance (does not include power tolerance)



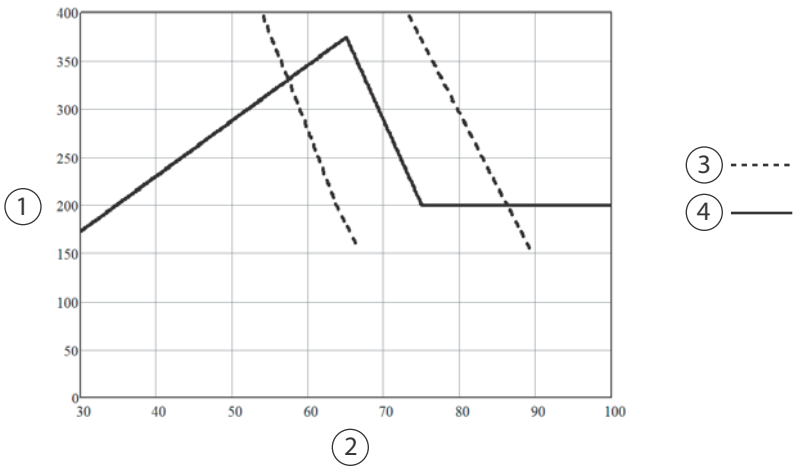
① Output power (watts)

② Load resistance (ohms)

③ Area of uncertainty in resistance

④ Nominal power curve

Bipolar Resection CUT: Output Power vs. Resistance (Effect 6) with Area of Uncertainty in Resistance (does not include power tolerance)



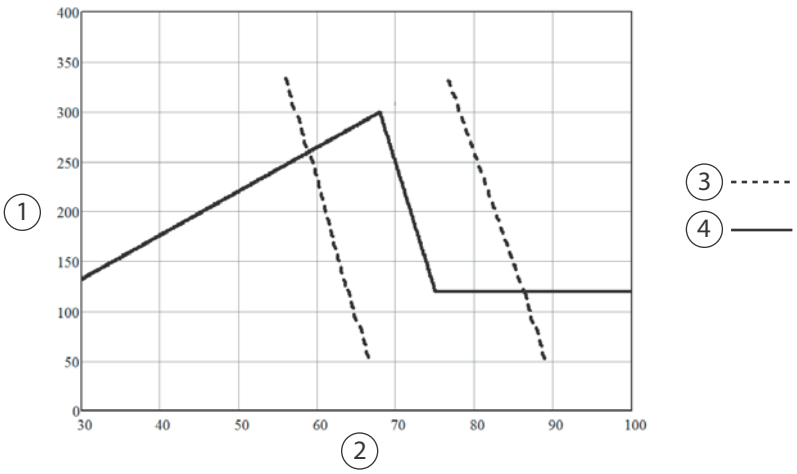
① Output power (watts)

② Load resistance (ohms)

③ Area of uncertainty in resistance

④ Nominal power curve

Bipolar Resection CUT: Output Power vs. Resistance (Effect 3) with Area of Uncertainty in Resistance (does not include power tolerance)



① Output power (watts)

② Load resistance (ohms)

③ Area of uncertainty in resistance

④ Nominal power curve

Chapter 5

System Setup

This chapter describes how to set up the energy platform, turn it on, and configure system settings.

Precaution

Read the instructions, warnings, and precautions provided with this energy platform and associated accessories before using. Specific instructions for electrosurgical instruments are not included in this manual.

Setup

Unpacking the System

Carefully unpack the contents of the shipping container. The container contains the following items:

- Valleylab FT10 FT Series Energy Platform
- Power cord
- First-time setup guide
- Quick reference card
- User's guide
- DVD with user's guide translations and service manual
- Ethernet cable
- Monopolar foot-pedal adapter
- Bipolar Resection foot-pedal adapter
- Fuses for 220-240 VAC

Before Starting the System

Important

The VLFT10GEN is intended for use in a hospital environment.

The operator of the generator may be as far away from the generator as 2 ft. (60 cm) [direct product interaction], 5 ft. (1.5 m) [inside the sterile field], and 13 ft. (4 m) [across the room working with other equipment].

Notice

Before plugging the generator into a power receptacle, verify that the installed fuses are appropriate for the local input line voltage. See *Input Power* on page 4-3.

1. Verify the system is off and the power cord is unplugged.
2. Place the energy platform outside the sterile field on a flat, stable surface such as a table, platform, boom system, or Valleylab Universal Generator Cart (VLFTCRT). Refer to local codes or the procedures for the local institution.
3. If necessary, connect the equipotential ground connection to a ground source.
4. Plug the system power cord into the rear panel receptacle.
5. Plug the system power cord into a grounded power receptacle. The On/Off button illuminates yellow.

Precaution

Do not plug the system power cord into a power strip or extension cord.

Turning On the VLFT10GEN

1. Turn on the system by depressing the On/Off button on the front panel. Observe the following during the power-on self-test (POST):
   - The Covidien logo appears on screen.
   - A status bar indicates authentication activity.
   - The system revision code appears.
   - A tone sounds upon completion of the power-on self-test (POST).
   - The REM (Return Electrode Monitoring) indicator appears below the touchscreen: red if an REM-alarm condition exists; green if no REM-alarm condition exists.
   - If an REM-alarm condition exits, refer to *Correcting a REM-Alarm Condition* on page 8-2.
2. If the self-test is not successful, an alarm tone sounds. An error screen appears on the touchscreen. Note the information on the display and refer to Chapter 8, *Troubleshooting*

Warning

Patient Safety Use the energy platform only if the power-on self-test has been completed as described in this manual, otherwise inaccurate power outputs may result.

3. **Required for initial start up—**The generator must be set up using the Valleylab Exchange Remote Software System. For instructions, refer to the *First-Time Setup Guide* and the *Valleylab Exchange Remote Software System User's Guide*.

   These documents are available online at http://www.medtronic.com/covidien/support/valleylab-exchange.

Turning Off the VLFT10GEN

1. **Normal Power-off:** Turn off the system by depressing the On/Off button (illuminated green) on the front panel for at least 1 second. Observe the following during the power-off:
   - The system exits the screen.
   - The screen displays the power-down sequence.
   - Once the power-down sequence is complete, the screen turns off and the On/Off button illuminates yellow.
   - Power-down is complete.

2. **Force Quit option:** If the system was powered up but non-responsive, press and hold the On/Off button for at least 10 seconds and observe the following:
   - The screen turns off and the On/Off button illuminates yellow.
   - Power-down is complete.

System Functions

The VLFT10GEN system functions are accessed from buttons on the front panel: On/Off, Restore Settings, Audio Volume, and Service and Settings.

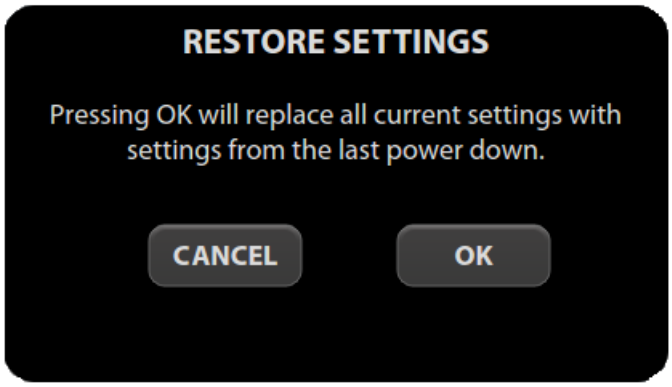
On/Off

When the system is plugged into a power source, the On/Off button appears yellow. Turn on power to the energy platform by pressing and holding the On/Off button for 0.25 seconds. After a successful power-on self-test, the On/Off button illuminates green. A tone sounds to signal a successful system power up.

Press and hold the button for 1 second to turn power off. The button illuminates yellow when the system is powered down. If a system is non-responsive, holding the button for 10 seconds will power down the system.

Restore Settings

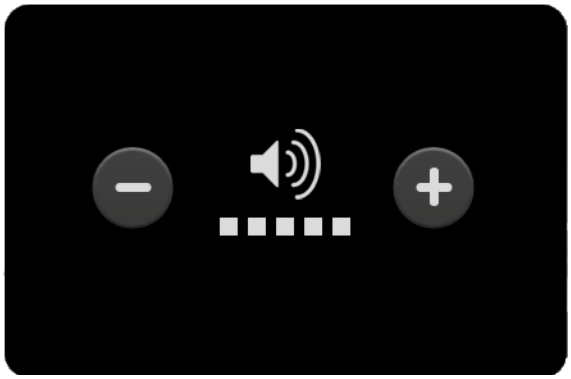
Select the Restore Settings button on the front panel to reset the system to the settings in use when the system was last powered down using the On/Off button. Accepting the prompt in the dialog box will reset all quadrants to their last setting. All modes and values are reset with the exception of audio volume and Auto Bipolar setting.



Touch **OK** and the touchscreen will display the last settings entered into each of the quadrants prior to shutting off the system.

Audio Volume

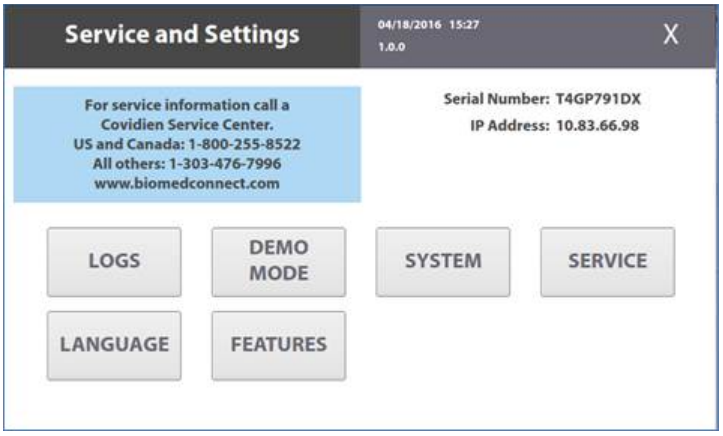
The VLFT10GEN has five levels of audio volume. Press the Audio Volume button on the front panel to view the volume-select menu.



The factory setting is as shown with the volume set at it's highest level. Adjust the volume using the + or - buttons. Dismiss the dialog box by touching the screen outside of the volume menu.

Service and Settings

The *Service and Settings* menu is accessed by pressing the gears button on the front panel.



The *Service and Settings* menu displays the generator serial number, IP address (if connected to the network), software version number, and contact information for the Covidien Service Center.

It provides available options for

- Viewing logs
  - Events Log
  - Error Log
  - Error Histogram
- Enabling DEMO Mode
- Selecting system settings
  - System Config
  - Diagnostics
  - Network
  - Time Zone
  - Calibration Info
- Accessing system service functions
  - Qualified service personnel can access service functions from a password-protected menu.
- Selecting a language
- Enabling Features

- SOFT COAG Mode
- SHARED COAG Mode
- Auto Bipolar
- Bipolar Ammeter

Logs

The LOGS button displays the LOGS menu with three options.

1. Touch the **LOGS** button to view the Logs menu:
   - EVENTS—A detailed display of all user actions and generator events on the VLFT10GEN
   - ERROR—A display of all recorded system errors with details
   - ERROR HISTOGRAM—A summary of how often an error has occurred
2. Touch entries to view available details:
   - EVENTS—Touch an event entry to view details. Touch **BACK** to return to the Event Log screen.
   - ERROR LOG—Touch an error to view its details in the *Error Details* dialog box. Touch the **SHOW EVENTS** button to view related events in the Events log entries. Touch **BACK** to return to the *Error Log* screen.
   - ERROR HISTROGRAM—Entries in the *Error Histogram* dialog box are not linked to other logs.

Important

Log files are maintained when the system is powered down. The time when the system was powered down or experiences a total loss of power is also logged.

When log files reach capacity, the earliest log is deleted to make room for the newest log.

Generator log files can be downloaded using Valleylab Exchange Remote Software System and viewed on a computer. For more information go to: http://www.medtronic.com/covidien/support/valleylab-exchange.

The Valleylab Exchange user's guide available from the site provides instructions for downloading log files.

DEMO Mode

DEMO mode is used for demonstration of the generator and accessories only. DEMO mode enables monopolar activation through an attached instrument without the use of a REM patient return electrode. When the monopolar surgery is performed clinically, the required return electrode provides a safe path for the current introduced to the patient's body.

Warning

DEMO mode delivers monopolar energy without the use of a patient return electrode, and is intended for demonstration purposes only. Chance of burns to the patient significantly increase when DEMO mode is used for clinical procedures.

Enable DEMO Mode

1. Touch **DEMO MODE** in the *Service and Settings* screen.
2. Touch the **Enable DEMO MODE** button to place the quadrants in DEMO mode. A reminder is posted: "NOT FOR CLINICAL USE."

3. Touch the screen anywhere outside the EXIT DEMO MODE button to temporarily remove the message, allowing full access to the controls.
4. Proceed with any practice or demonstration scenarios. While in DEMO mode, the REM alarm is deactivated, but RF power is still delivered.

Warning

DEMO mode does not monitor the quality of pad contact with the patient. Therefore, no warning will be issued from the generator when pad-to-patient contact degrades.

5. Touch **EXIT DEMO MODE** to close DEMO mode and return to the functional screen. This will enable REM.

System Menu

The System button accesses settings for

- System Config
- Diagnostics

- Network
- Time Zone
- Calibration Info

System Configuration

System Configuration displays the hardware, software, and firmware components of the VLFT10GEN. This information is for reference only. No changes to the configuration can be performed from this screen.

Diagnostics

- **Instrument Bar Code Reader**—Insert a Covidien device with a scannable bar code. When the SCAN button is touched, the bar-code reader displays the current view from the reader's camera to verify it is working properly.
- **Self Test**—Runs the same system test as the power-on self-test when the system is turned on. Current power and mode settings in each quadrant will be lost as the system is reset to run the power-on self-test. These settings can be retrieved by pressing the Restore Settings button on the front panel. If the self-test is successful, a tone sounds.

Network

The Network button allows the technician to select a network connection to the Valleylab Exchange server for service operations. There are 4 ways to connect to the IT network:

- Wired Point-to-Point
- Wired Automatic
- Wired Manual
- Wireless (presently not available)

Wired Point-to-Point

This selection allows the generator to communicate directly with another computer through an Ethernet cable that is connected from the generator to the computer.

Wired Automatic

This selection allows the generator to communicate on the IT network through an Ethernet cable that is connected from the generator to a router or the facility's DHCP server. The generator is automatically assigned an IP address by the facility's DHCP server.

Wired Manual

This selection allows the generator to communicate on the IT network through an Ethernet cable that is connected from the generator to a router or the facility's DHCP server. The technician must manually set a static IP address, network mask, and default gateway address.

Wireless (presently not available)

This selection allows a wireless connection from the generator to a router or to a DHCP server via a WiFi access point broadcasting a non-hidden SSID. The technician selects which SSID to connect to and enters a WPA2 password to enable the connection. The generator is automatically assigned an IP address by the facility's DHCP server.

Time Zone

Select a region from the drop-down menu to set the time zone used by the system clock. The time and date are originally set during the initial connection to Valleylab Exchange (see page 5-3).

Calibration Info

Calibration Info displays all of the energy calibration values stored in the VLFT10GEN. This information is for reference only. No changes to the calibration values can be performed from this screen.

Service Menu

Items in the Covidien Service menu are specifically for qualified service personnel and are password protected. The password is 423213. The Service Menu button accesses settings for

- RF Output Test
- Touchscreen Verification
- Energy Calibration
- Country Code
- RF Logging

RF Output Test

The *RF Output Test Screen* is used to test the RF output of the generator. It allows a technician to output RF in a specified mode, to a specified energy channel, at a specified power level. While RF is output, the *RF Output Test Screen* displays the internal sensor readings of average power, RMS voltage, RMS current, impedance magnitude, impedance phase angle, REM impedance magnitude, and REM impedance phase angle.

Touchscreen Verification

The Touchscreen Verification screen allows the technician to calibrate the touchscreen and verify proper calibration. See *Touchscreen Calibration* on page 7-2 for instructions on how to perform touchscreen calibration.

Energy Calibration

The Energy Calibration screen allows the technician to calibrate the RF output. See *Energy Calibration* on page 7-4 for instructions on how to perform energy calibration.

Country Code

The Country Code screen allows the technician to identify in which country the generator is set up to operate. If this is the first time using the generator, the country code needs to be selected before the LigaSure/Bipolar energy channel will function. See the *First Time Setup Guide* for instructions on how to set the country code.

After the initial setting of the country code, the code can only be changed using the remote software-update site Valleylab Exchange. For more information go to http://www.covidien.com/surgical/services/valleylab-exchange.

The Valleylab Exchange user's guide available from the site provides instructions for changing country codes.

RF Logging

By default, the generator will log RF activation data for Ligasure instruments. To log RF activation data for all instruments, touch the Enable All Modes RF Logging button. The button changes to Set Ligasure Only RF Logging. To log only Ligasure instrument RF data, touch this button again or cycle power on the generator.

Language Selection Menu

The Language Selection Menu presents 25 buttons; each labeled with a language available for all software screens and options in the software interface. To change the language, select the button labeled with the desired language. The software interface changes the non-service windows to the selected language after the language button is selected. Some service screens are not translated.

Feature Enabling Menu

The Feature Enabling menu presents a list of all of the extra features available with the installed software. Some features are available for free while other features need to be purchased separately to be used on the generator. The unavailable features are grayed out in the menu. The available features have a toggle for enabling their use on the clinical screen. If a feature is enabled, or on, the feature's settings can be accessed on the clinical screen. If a feature is disabled, or off, the feature's settings are not available on the clinical screen. The default setting for each feature is disabled, or off. All changes to the feature settings are retained through the removal of AC power.

Chapter 6

Testing Setup and Functional Tests

This chapter describes how to set up and test the VLFT10GEN.

After unpacking or servicing the system, set up the system, perform any required calibration (see Chapter 7, *Calibrations*), and verify correct functionality.

If the system does not satisfactorily complete the power-on self-test, then cycle the system power. If the VLFT10GEN continues to fail the self-test, contact Covidien Technical Service.

This chapter contains tests that are specific for field testing. There are some tests that are performed in the manufacturing environment that are not field requirements. Those tests are not described in this manual.

Periodic Safety Check (Routine Maintenance)

Perform the following safety check once a year, or as directed in Chapter 8, to verify that the system is functioning properly. Record the test results for reference in future tests. Copy the check sheet at the end of this chapter for use in recording the results. Keep the completed check sheet for future reference. If the system fails to meet any of the checks, refer to Chapter 8, *Troubleshooting*.

Warning

Electric Shock Hazard When taking measurements or troubleshooting the system, take appropriate precautions, such as using isolated tools and equipment, using the "one hand rule", etc.

Electric Shock Hazard Do not touch any exposed wiring or conductive surfaces while the system is disassembled and energized. Never wear a grounding strap when working on an energized system.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

When testing RF equipment, follow these test procedures. Keep test leads to the minimum length usable; lead inductance and stray capacitance can adversely affect readings. Carefully select suitable ground points to avoid ground loop error in measurements.

The accuracy of most RF instruments is approximately 1%–5% of full scale. Using uncompensated scope probes causes large errors when measuring high-voltage RF waveforms.

Full definitions of the periodic safety checks are found throughout the remainder of this section. A summary of the periodic safety check is:

- Inspect the system and accessories
- Inspect the internal components (when required)
- System self-test
- Verify the audio
- Verify the power output
- Verify REM function
- Verify cross coupling
- Check leakage current and ground resistance

Inspecting the System and Accessories

Equipment list

- Monopolar foot pedal
- Bipolar foot pedal
- Ligasure foot pedal
- Monopolar instrument (preferred) or test leads
- Bipolar instrument cord (preferred) or test leads
- LigaSure instrument (preferred) or test leads

For a rear-panel inspection, turn off the system, and disconnect the power cord from the wall receptacle.

Rear Panel

1. Check the rear-panel foot pedal receptacles for obstructions or damage. Check for a secure fit by inserting the foot pedal connector into the Bipolar, Monopolar 1, Monopolar 2, and LigaSure/Bipolar foot pedal connectors.
2. If any foot pedal connector is damaged or unusable, return the system to Covidien Technical Service. For more information, see *Covidien Technical Service* on page 10-6.
3. Remove the fuse and verify correct voltage and current rating for usage environment. Refer to *Input Power* on page 4-3.

Front Panel

1. Turn on the generator and navigate to Demo Mode. See *DEMO Mode* on page 5-7.
2. Check the Monopolar 1 and Monopolar 2 instrument receptacles for obstructions or damage:
   - Insert a standard two-button pencil into the Monopolar 1 and Monopolar 2 receptacles to verify a secure fit
   - Insert a Force TriVerse electrosurgical pencil into the Monopolar 2 receptacle to verify a secure fit.
   - Verify the appropriate Monopolar quadrant on the display becomes active, indicating the instrument has been detected:
     – For the standard two-button electrosurgical pencil, the Standard Monopolar controls become active in the adjacent Monopolar quadrant.
     – For the Force TriVerse electrosurgical pencil, the Valleylab mode is available in the Monopolar 2 quadrant.
3. If either of the monopolar receptacles is damaged, contact Covidien Technical Service (see *Covidien Technical Service* on page 10-6).
4. Check the Patient Return Electrode (REM) receptacle for a broken pin or an obstruction.

5. If the REM receptacle is damaged or obstructed, contact Covidien Technical Service (see *Covidien Technical Service* on page 10-6).
6. Check the Bipolar instrument receptacle for obstructions or damage:
   - Insert the bipolar instrument or cable into the receptacle to verify a secure fit.
   - Verify the Bipolar quadrant on the touchscreen becomes active, indicating the instrument has been detected.
7. If the bipolar receptacle is damaged, return the system to Covidien Technical Service (see *Covidien Technical Service* on page 10-6).
8. Check the LigaSure/Bipolar receptacle for obstructions or damage:
   - Insert a compatible LigaSure instrument into receptacle to ensure a secure fit.
   - Verify the LigaSure quadrant of the touchscreen becomes active, indicating the instrument has been detected:
9. If the LigaSure/Bipolar receptacle is damaged or the "Invalid Instrument" message appears, contact Covidien Technical Service (see *Covidien Technical Service* on page 10-6).

Foot Pedals

1. Remove the foot pedal from the system.
2. Inspect the connector and receptacle for damage or corrosion.
3. Inspect the foot pedal for damage.
4. Reconnect the foot pedal to the system.

Power Cord

1. Verify the cord is unplugged from the wall receptacle and remove the power cord from the system.
2. Inspect the power connector and receptacle for damage.
3. Inspect the power cord for damage.
4. Reconnect the power cord to the system.
5. Turn on the generator to test functionality.

Inspecting Internal Components (when required)

This section is only required when the system is open for troubleshooting, repair, or spare replacement.

Equipment list

- Torx T30 screwdriver

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

1. Turn off power to the system and remove the power cord from the wall outlet and the generator power cord receptacle.
2. Remove the four bolts that secure the cover to the chassis.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Slide the front and back bezels away from the main chassis to release the locking/alignment features.
4. Lift the cover off the chassis. Set the cover aside for reinstallation.
5. Remove the top E-PAC foam layer. Set aside the foam for reinstallation.
6. Verify that all connectors are firmly seated.
7. If further investigation is required, remove subsequent E-PAC foam layers and housed PCBAs.
8. Inspect each PCBA for damaged components or wires, cracks, and corrosion.
9. If there is evidence of damage on the Controller PCBA, Steering Relay PCBA, Front Panel, Footswitch PCBA, or the RF PCBA, contact Covidien Technical Service (see *Covidien Technical Service* on page 10-6).
10. Inspect the entire device for loose debris. If any debris exists, carefully remove the debris before proceeding.
11. Replace the cover using the four mounting bolts to secure.

Power Up Check

System Self Test

Turning on the system initiates an internal power-on self-test to verify the calibration. The self-test also checks the operation of the speaker, all indicators, and the display.

Warning

Use the system only if the power-on self-test has been completed as described. Otherwise, inaccurate power outputs may result.

1. There are two ways to run a system self-test:
   - If the System is OFF, turn on the system by pressing the **On/Off** button on the front panel.
   - If the system is ON, navigate to the system self-test screen by pressing the gears button on the front panel, touching the **System** button on the touchscreen, touching the **Diagnostics** button on the touchscreen, and then touching the **Self-Test** button on the touchscreen.
2. Verify the following:
   - All visual indicators and display on the front panel illuminate.
   - Test tones sound to verify that the speaker is working properly.
3. If the power-on self-test is successful, the following occurs:
   - The display illuminates and shows all 4 quadrants.
   - The REM alarm indicator illuminates.

   or
4. If the self-test is not successful, an alarm tone sounds. An error screen appears on the display. Note the information on this display and refer to Chapter 8, *Troubleshooting*.
5. Activate the monopolar instruments by pressing the handswitches to test functionality.
6. Set Auto Bipolar.
7. Activate the bipolar instrument by closing the tines to test functionality.
8. Activate the foot pedal with a corresponding instrument inserted to test functionality and confirm the audio tone.

Verifying the Audio

1. Press the **Audio** button on the front panel.
2. Press the **+ and -** buttons on the display. Verify that the audio is active after each +/- button press and is distortion free.

Verifying Power Output

Equipment list

- Test cable leads
- True RMS meter or oscilloscope
- Current transformer—Volt per Amp equal to 0.10 with 10 MHz bandwidth

  For each power output test:

  – Enter *RF Output Test Screen* as described in the previous section.

  – Test power output with the Energy Mode, Load, and Power specified in the following tables.

  – Activate and deactivate power output as described in the RF Output Test Screen section.
- 50 Ω, 100 Ω, 300 Ω, 500 Ω, all 250 W, 1% tolerance, non-inductive resistive loads

RF Output Test Screen

Navigation

1. To enter *RF Output Test Screen*, touch the Service/Settings button on the front panel.
2. Touch the **Service** button, enter the password (423213), and touch **OK**.
3. Select the **RF Output Test** button on the screen.

Setup

1. *RF Mode Selection* - Select test-specific RF mode from RF-Mode pull-down menu.

   Note: Not all modes listed in the *RF Mode Selection* window are for clinical or biomedical use. These options are for exclusive use of Covidien service centers.
2. *Energy Channel Selection* - Select Energy Channel by pressing test-specific Energy Channel button. A default setting is provided based on the RF mode selected.
3. *Power Setting* - Set the power to test-specific power setting by touching the up or down arrow. A default setting is provided based on the RF mode selected.

RF Output Activation

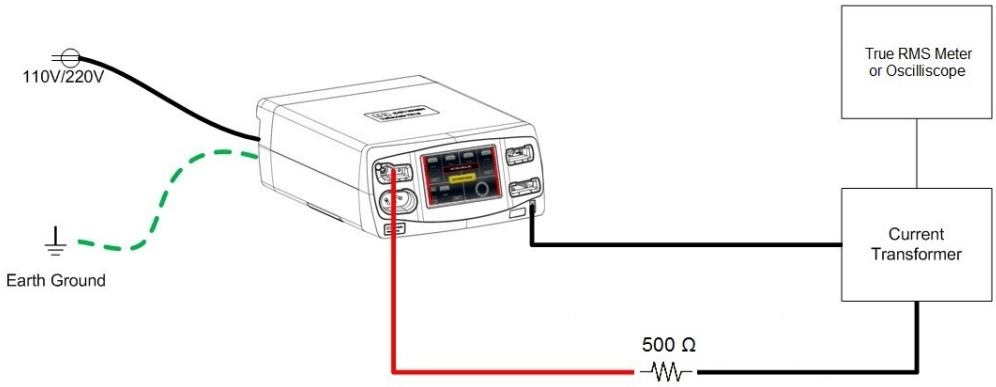
Touch the **Activate** button to activate RF output with the selected Energy Channel/RF Mode/Power Setting.

RF Output Deactivation

Touch **Deactivate** to end RF output. To deactivate RF output and clear the displayed values, touch **Deactivate No Hold.** To deactivate RF output and retain the displayed values, touch **Deactivate Hold Values**.

Testing Monopolar 1 COAG Output - 500 Ω Load

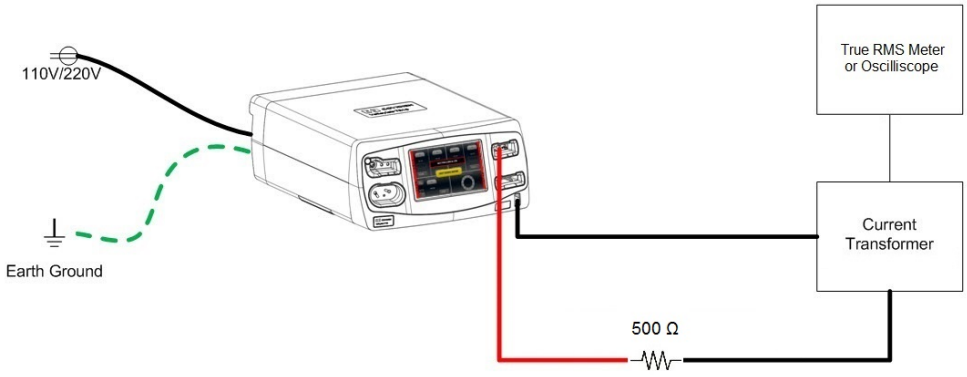
Power Setting	Energy Mode	Specifications
120 W	SPRAY	424 – 570 mA



1. The *RF Output Test Screen* should be set up with the following settings specific to the table above. See *RF Output Test Screen* on page 6-7 for setup instructions.
   - RF Mode
   - Energy Channel
   - Power
2. Connect a test cable from the left tine of the Monopolar 1 channel receptacle to one side of the 500 Ω load.
3. Short the REM receptacle pins and connect a test cable from the shorted REM jack through the current transformer, to the other side of the 500 Ω load.
4. Activate RF energy by pressing the **Activate** button on the touchscreen.
5. Verify the power output is within the specification range.
6. Deactivate RF energy by pressing one of the **Deactivate** buttons on the touchscreen.

Testing Monopolar 2 COAG Output - 500 Ω Load

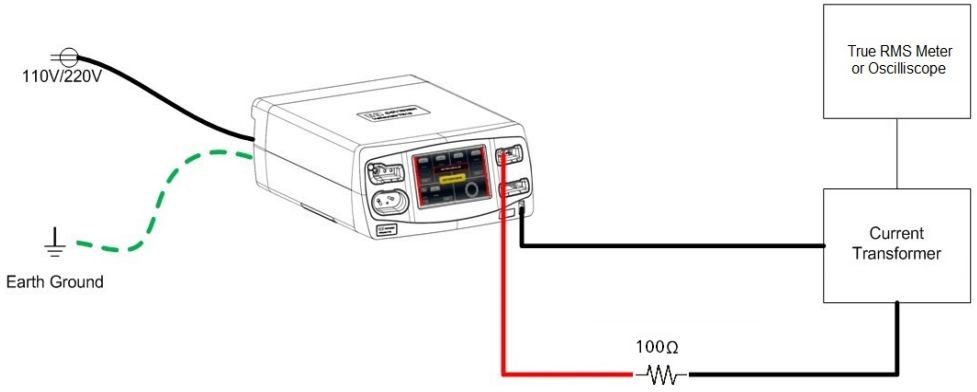
Power Setting	Energy Mode	Specifications
120 W	SPRAY	424 – 570 mA
10 W	SPRAY	101 – 181 mA
30 W	FULGURATE	205 – 285 mA



1. The *RF Output Test Screen* should be set up with the following settings specific to the table above. See *RF Output Test Screen* on page 6-7 for setup instructions.
   - RF Mode
   - Energy Channel
   - Power
2. Connect a test cable from the left tine of the Monopolar 2 channel receptacle to one side of the 500 Ω load.
3. Short the REM receptacle pins and connect a test cable from the shorted REM jack through the current transformer, to the other side of the 500 Ω load.
4. Activate RF energy by pressing the **Activate** button on the touchscreen.
5. Verify the power output is within the specification range.
6. Deactivate RF energy by pressing one of the **Deactivate** buttons on the touchscreen.
7. Repeat steps 1 – 6 for each row of the table above for the Monopolar 2 channel receptacle.

Testing Monopolar 2 COAG Output - 100 Ω Load

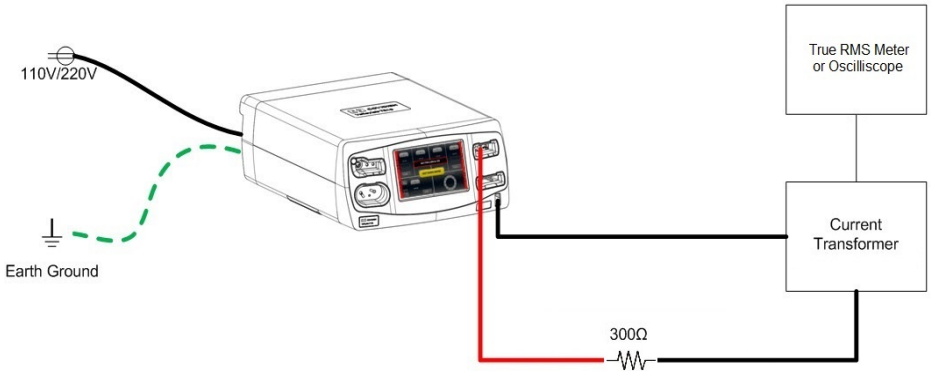
Power Setting	Energy Mode	Specifications
120 W	SOFT	948 – 1274 mA



1. The *RF Output Test Screen* should be set up with the following settings specific to the table above. See *RF Output Test Screen* on page 6-7 for setup instructions.
   - RF Mode
   - Energy Channel
   - Power
2. Connect a test cable from the left tine of the Monopolar 2 channel receptacle to one side of the 100 Ω load.
3. Short the REM receptacle pins and connect a test cable from the shorted REM jack through the current transformer, to the other side of the 100 Ω load.
4. Activate RF energy by pressing the **Activate** button on the touchscreen.
5. Verify the power output is within the specification range.
6. Deactivate RF energy by pressing one of the **Deactivate** buttons on the touchscreen.

Testing Monopolar 2 CUT Output - 300 Ω Load

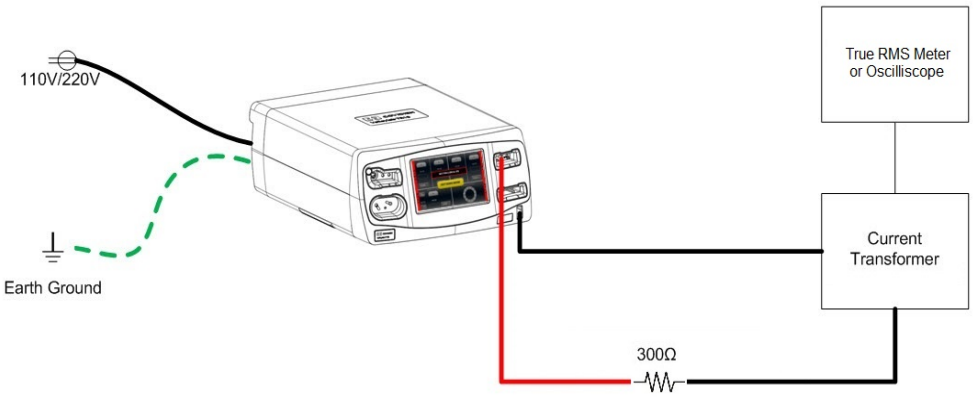
Energy Mode	Power Setting	Specifications
PURE	10 W	143 – 223 mA
PURE	300 W	865 – 1163 mA
BLEND	200 W	707 – 949 mA



1. The *RF Output Test Screen* should be set up with the following settings specific to the table above. See *RF Output Test Screen* on page 6-7 for setup instructions.
   - RF Mode
   - Energy Channel
   - Power
2. Connect a test cable from the left tine of the Monopolar 2 channel receptacle to one side of the 300 Ω load.
3. Short the REM receptacle pins and connect a test cable from the shorted REM jack through the current transformer, to the other side of the 300 Ω load.
4. Activate RF energy by pressing the **Activate** button on the touchscreen.
5. Verify the power output is within the specification range.
6. Deactivate RF energy by pressing one of the **Deactivate** buttons on the touchscreen.
7. Repeat steps 1 – 6 for each row of the table above for the Monopolar 2 channel receptacle.

Testing Monopolar 2 VALLEYLAB Mode Output - 300 Ω Load

Power Setting	Energy Mode	Specifications
75 W	VALLEYLAB	433 – 581 mA

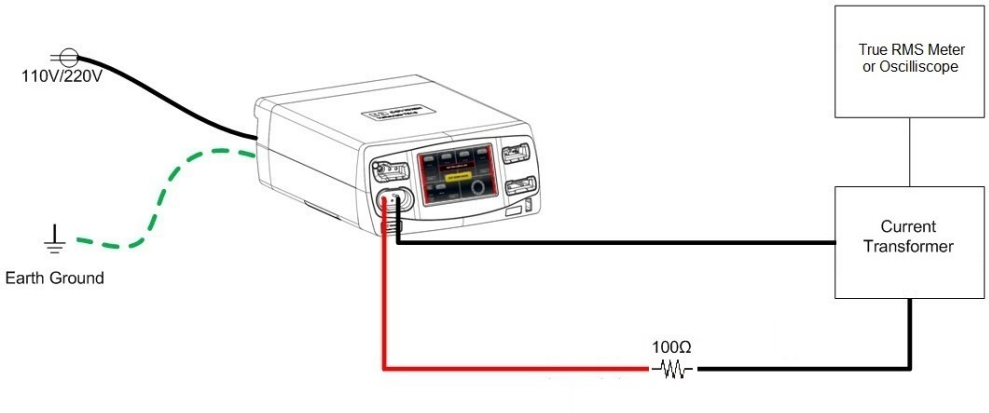


1. The *RF Output Test Screen* should be set up with the following settings specific to the table above. See *RF Output Test Screen* on page 6-7 for setup instructions.
   - RF Mode
   - Energy Channel
   - Power
2. Connect a test cable from the left tine of the Monopolar 2 channel receptacle to one side of the 300 Ω load.

   Note: This test is not to be performed on the Monopolar 1 receptacle.
3. Short the REM receptacle pins and connect a test cable from the shorted REM jack through the current transformer, to the other side of the 300 Ω load.
4. Activate RF energy by pressing the **Activate** button on the touchscreen.
5. Verify the power output is within the specification range.
6. Deactivate RF energy by pressing one of the **Deactivate** buttons on the touchscreen.

Testing Bipolar Energy Channel Output - 100 Ω Load

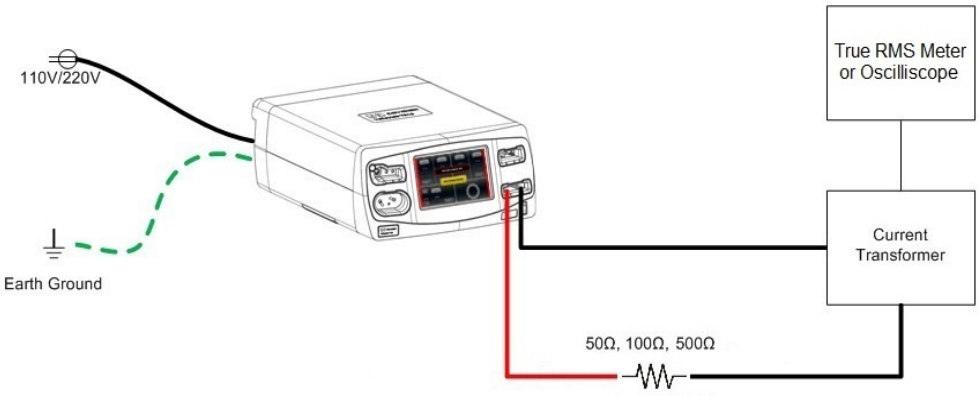
Power Setting	Energy Effect	Load	Specification
95 W	Bipolar HIGH	100 Ω	843 – 1133 mA
40 W	Bipolar MEDIUM	100 Ω	547 – 735 mA
15 W	Bipolar LOW	100 Ω	335 – 450 mA



1. The *RF Output Test Screen* should be set up with the following settings specific to the table above. See *RF Output Test Screen* on page 6-7 for setup instructions.
   - RF Mode
   - Energy Channel
   - Power
2. Connect a test cable from the right tine of the bipolar channel receptacle through the current transformer to the 100 Ω load.
3. Connect a test cable from the left tine of the bipolar channel receptacle to the other side of the 100 Ω load.
4. Activate RF energy by pressing the **Activate** button on the touchscreen.
5. Verify the power output is within the specification range.
6. Deactivate RF energy by pressing one of the **Deactivate** buttons on the touchscreen.
7. Repeat steps 1 – 6 for each row of the table above.

Testing LigaSure/Bipolar Output

Power Setting	Energy Effect	Load	Specifications
Effect 6	Bipolar Resection - COAG	100 Ω	1145 – 1538 mA
Effect 6	Bipolar Resection - CUT	500 Ω	547 – 735 mA
5 W	LigaSure	50 Ω	276 – 357 mA
350 W	LigaSure	50 Ω	1940 – 2740 mA



1. The *RF Output Test Screen* should be set up with the following settings specific to the table above. See *RF Output Test Screen* on page 6-7 for setup instructions.
   - RF Mode
   - Energy Channel
   - Power
2. Connect a test cable from the right tine of the LigaSure/Bipolar channel receptacle through the current transformer to the load identified in the table above.
3. Connect a test cable from the left tine of the LigaSure/Bipolar channel receptacle to the other side of the load identified in the table above.
4. Activate RF energy by pressing the **Activate** button on the touchscreen.
5. Verify the power output is within the specification range.
6. Deactivate RF energy by pressing the **Deactivate No Hold** button on the touchscreen.
7. Repeat steps 1 – 6 for each row of the table above.

Verifying REM Function

Equipment list

- REM plug
- Resistance decade box, 1 Ω resolution, 1% tolerance, 1/8 W or greater, or 50 Ω and 100 Ω 1% tolerance, non-inductive resistance loads

1. Enter *RF Output Test Screen*. Set the resistance decade box to 100 Ω or select a 100 Ω load. Connect the resistance box to the REM receptacle, and confirm that the REM ZMag measurement on the display is within the specification 93 Ω to 107 Ω. Confirm the REM LED indicator light illuminates green.

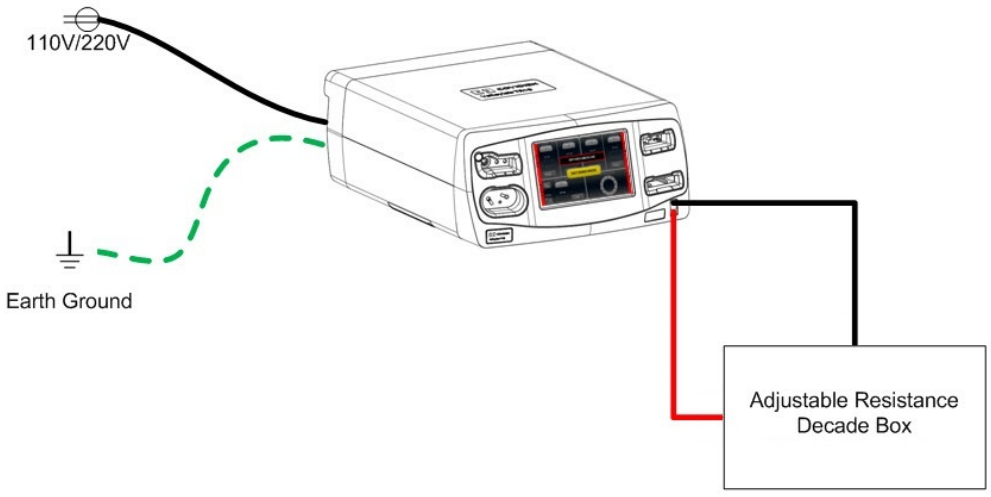
Important

If the REM ZMag measurement on the display does not refresh, set the output power to 1 W, touch the **Activate** button, then touch **Deactivate no hold** button.

2. Decrease the resistance to 50 Ω or select a 50 Ω load and verify that the REM ZMag measurement on the display is within the specification 43 Ω to 57 Ω.
3. Decrease the resistance to 0 Ω or short the REM pins together and verify that the REM ZMag measurement on the display is within the specification 0 Ω to 4 Ω.Confirm the REM LED indicator light illuminates red.
4. Remove any connector that may be in the REM port.
5. Verify that the REM ZMag measurement on the display is less than 2000 Ohms.

Precaution

If the REM ZMag reading is greater than 2000 Ohms, the Steering Relay PCBA will need to be replaced to ensure the proper performance of REM.



Verifying Cross Coupling

Equipment list

- Banana cables, 18 inches or shorter
- True RMS meter
- Current transformer—Volt per Amp equal to 0.10 with 10 MHz bandwidth
- 200 Ω, 250 W, 1% tolerance, non-inductive resistive load

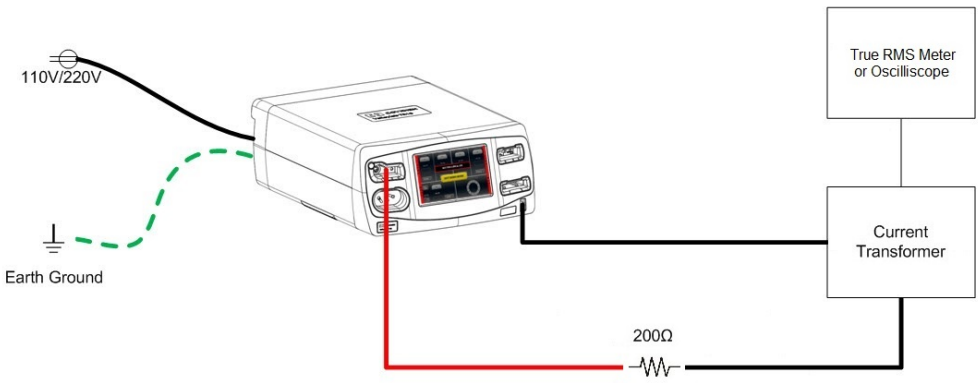
1. Navigate to the *RF Output Test Screen*.

   For each test:

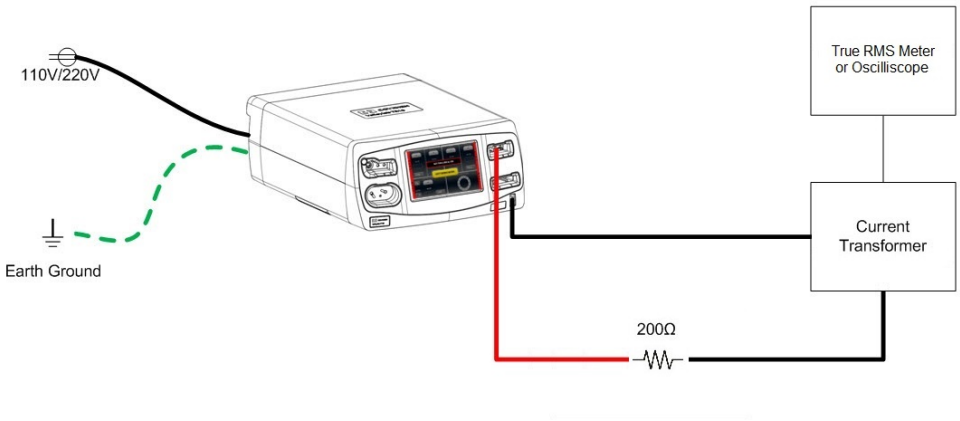
   - Set all modes to their maximum power settings as specified herein.
   - Activate each mode by touching the **Activate** button on the *RF Output Test Screen*.

2. **Mono 1 current** - Connect a 200 Ω load to the Mono 1 left tine output. Short the REM receptacle pins and connect a test cable from the shorted REM jack through the current transformer to the other side of the 200 Ω load. Activate the following modes one at a time as specified in the following list. Ensure that the current is within the specification measured by the current transformer: 0 mA to 150 mA

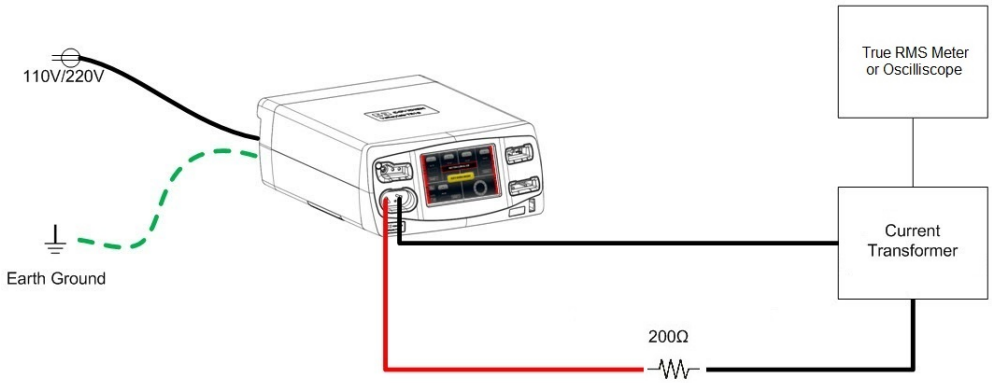
   - Bipolar Resection CUT - Effect 6 setting
   - Bipolar HIGH – 95 W setting
   - Mono 2 COAG SPRAY – 120 W setting
   - Mono 2 CUT PURE – 300 W setting



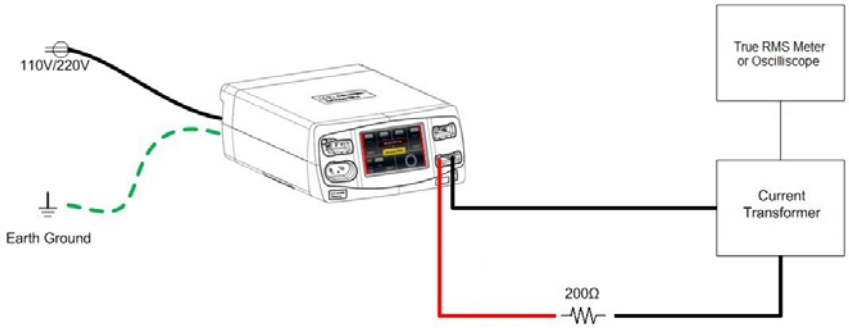
3. **Mono 2 current** - Connect a 200 Ω load to the Mono 2 left tine output. Short the REM receptacle pins and connect a test cable from the shorted REM jack through the current transformer, to the other side of the 200 Ω load. Activate the following modes one at a time as specified in the following list. Ensure that the current is within the specification measured by the current transformer: 0 mA to 150 mA.
   - Mono 1 CUT PURE – 300 W setting
   - Mono 1 COAG SPRAY – 120 W setting
   - Bipolar HIGH – 95 W setting
   - Bipolar Resection CUT – Effect 6 setting



4. **Bipolar current** - Connect a 200 Ω load to the left bipolar tine output. Connect the right tine output through the current transformer, to the other side of the 200 Ω load. Activate the following modes on at a time as specified in the following list. Ensure that the current is within the specification measured by the current transformer: 0 mA to 50 mA.
   - Bipolar Resection CUT – Effect 6 setting
   - Mono 2 COAG SPRAY – 120 W setting
   - Mono 1 CUT PURE – 300 W setting



5. **LigaSure/Bipolar current** - Connect a 200 Ω load from the left LigaSure/Bipolar output. Connect the right tine through the current transformer, to the other side of the 200 Ω load. Activate the following modes on at a time as specified in the following list. Ensure that the current is within the specification measured by the current transformer: 0 mA to 50 mA.
   - Mono 1 CUT PURE – 300 W setting
   - Bipolar HIGH – 95 W setting
   - Mono 2 COAG SPRAY – 120 W setting



Checking High-Frequency Leakage Current

Check the high-frequency leakage current and ground resistance before returning the generator to clinical use. Check the leakage current:

- After calibrating the system
- Annually

Equipment list

- 200 Ω, 250 W, 1% tolerance, non-inductive resistive load
- Current transformer
- True RMS meter
- Bipolar and monopolar foot pedals
- Leakage table - in accordance with IEC 60601-2-2, Figure 201.104.
- Test leads, 18 inches or shorter
- Banana cables, 18" or shorter

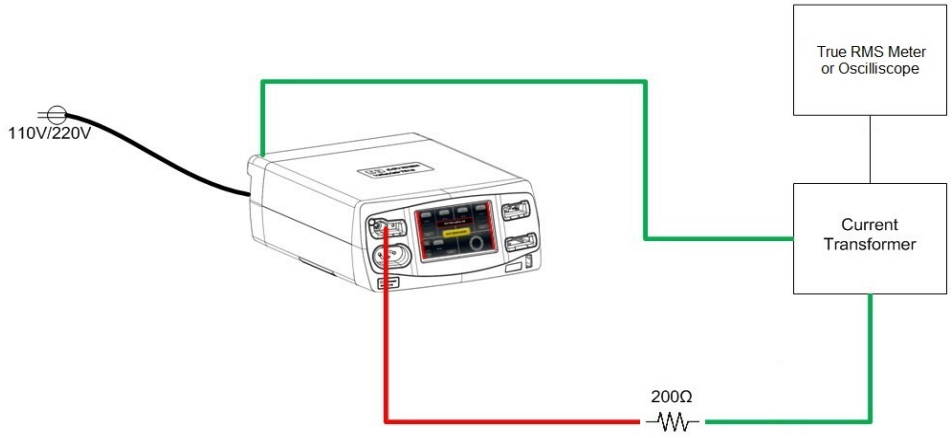
Note: The following leakage tests are a short-lead configuration where leakage is measured directly at the "high frequency surgical equipment terminals" per IEC 60601-2-2: 2009 clause 201.8.7.3.101 b.

Checking Monopolar High-Frequency Leakage Current

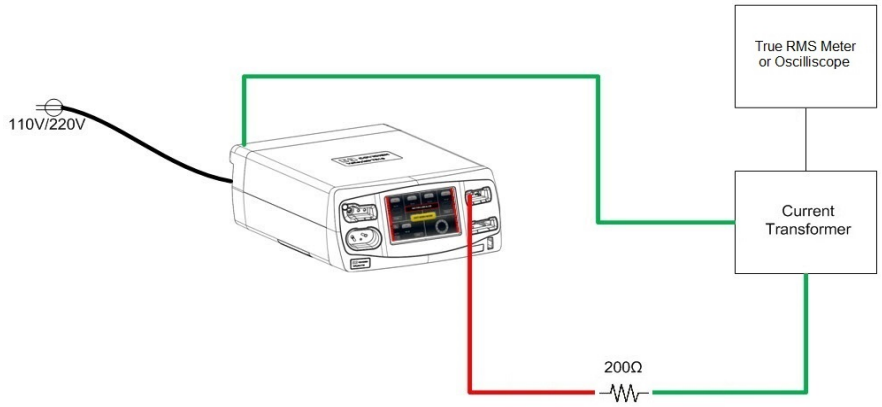
Notice

The system must be in *RF Output Test Screen* mode to activate the receptacle. See *RF Output Test Screen* on page 6-7 for proper screen setup.

1. Connect a 200 Ω load to the Monopolar 1 left tine. Connect the equipotential ground lug on the rear of the system through the current transformer to the other side of the 200 Ω load.
2. Manually activate Monopolar SPRAY mode on Monopolar 1 using the *RF Output Test Screen* at 120 W. Record the leakage current.



3. Press the **DEACTIVATE HOLD VALUES** button to deactivate RF energy.
4. Repeat steps 1 through 3 for Monopolar 2.



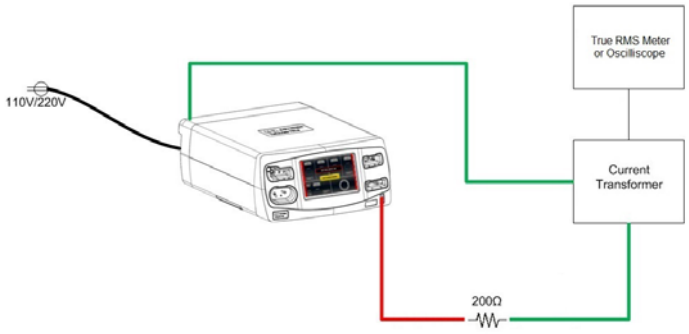
5. If using the leakage table, leakage current directly at the generator terminals should not exceed 100 mA for any mode. If the measurements still exceed 100 mA, contact Covidien Technical Service (see page 10-6) for further instructions.

Checking Patient Return High-Frequency Leakage Current

Notice
The system must be in *RF Output Test Screen* mode to activate the receptacle. See *RF Output Test Screen* on page 6-7 for proper screen setup.

1. Short the REM receptacle pins and connect to one side of the 200 Ω load. Connect the equipotential ground lug on the rear of the system through the current transformer, to the other side of the 200 Ω load.

2. In *RF Output Test Screen*, set the energy channel to Monopolar 2, the mode to SPRAY, and power to 120 W. Touch the **Activate** button. Record the leakage current. The leakage current should not exceed 100 mA for any mode.
3. Press the **Deactivate Hold Values** button to deactivate RF energy.
4. Repeat steps 1-3 for the following setups:
   - PURE (300 W)
   - BLEND (200 W)
   - FULGURATE (120 W)
   - SOFT (120 W)
   - VALLEYLAB (200 W)
   - SHARED SPRAY Dual (120 W)
5. If using the leakage table, leakage current directly at the generator terminals should not exceed 100 mA for any mode. If the measurements still exceed 100 mA, contact Covidien Technical Service (see page 10-6) for further instructions.



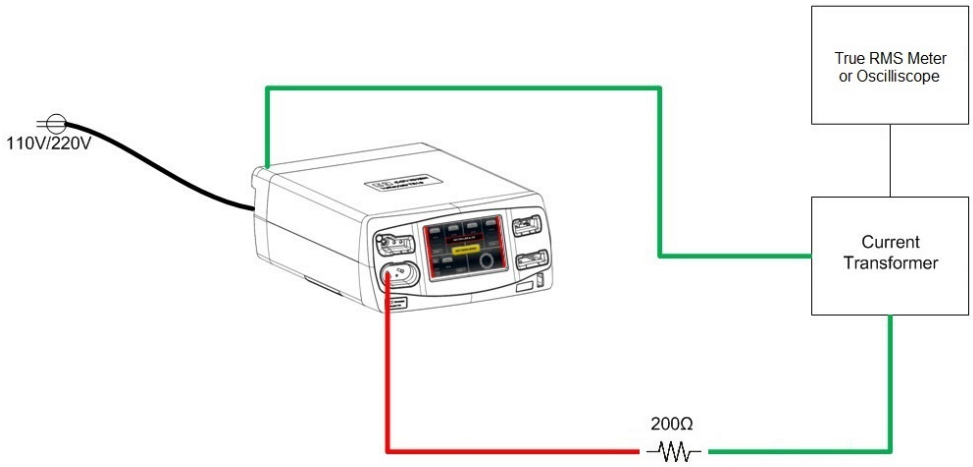
Checking Bipolar High-Frequency Leakage Current

Notice

The system must be in *RF Output Test Screen* mode to activate the receptacle. See *RF Output Test Screen* on page 6-7 for proper screen setup.

1. Remove the monopolar accessories and connect the left output tine of the bipolar receptacle to one side of the 200 Ω load. Connect the equipotential ground lug on the rear of the system through the current transformer, to the other side of the 200 Ω load.
2. Manually activate the Bipolar HIGH effect using the *RF Output Test Screen* at 95 W. Record the leakage current. It should not exceed 69 mA for any Bipolar mode.
3. Press the **DEACTIVATE HOLD VALUES** button to deactivate RF energy.
4. Repeat steps 1 – 3 for the right tine.

5. If the high-frequency leakage exceeds 69 mA, contact Covidien Technical Service (see page 10-6) for further instructions.

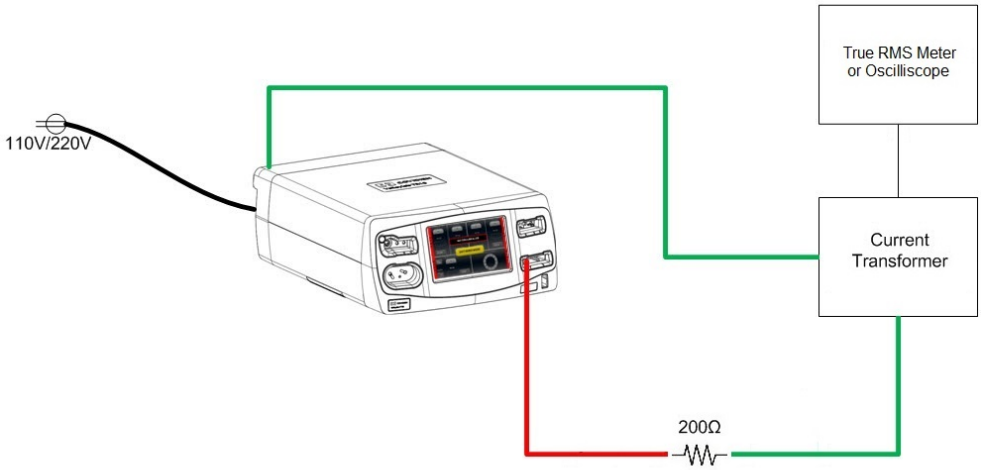


Checking LigaSure/Bipolar High-Frequency Leakage Current

Notice

The system must be in *RF Output Test Screen* mode to activate the receptacle. See *RF Output Test Screen* on page 6-7 for proper screen setup.

1. Connect the left output tine of the LigaSure/Bipolar receptacle to one side of the 200 Ω load. Connect the equipotential ground lug on the rear of the system through the current transformer to the other side of the 200 Ω load.
2. In *RF Output Test Screen*, set the mode to LigaSure, the power to 350 W, and touch the **ACTIVATE** button. Record the leakage current. The leakage current should not exceed 100 mA for any mode.
3. Press the **DEACTIVATE HOLD VALUES** button to deactivate RF energy.
4. Repeat steps 1 – 3 for the following setups:
   - Connect to the right output tine with Ligasure power set to 350 W.
   - Connect to the right output tine with Bipolar Resection CUT set to effect 6.
   - Connect to the left output tine with Bipolar Resection CUT set to effect 6.
   - Connect to the left output tine with Bipolar Resection COAG set to effect 6.
   - Connect to the right output tine with Bipolar Resection COAG set to effect 6.
5. If the high-frequency leakage exceeds 100 mA, contact Covidien Technical Service (see page 10-6).



Safety Testing in Accordance with IEC 60601-1

Check the low-frequency leakage current before returning the VLFT10GEN to clinical use.

Equipment list

- Safety tester

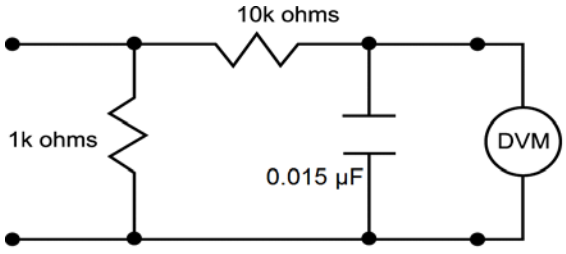
Note: Low-frequency tests are conducted at 10% above line voltage.

Checking Low-Frequency Leakage Current

Check the low-frequency leakage current before returning the VLFT10GEN to clinical use.

Equipment list

- Digital Voltage Meter (DVM)
- Leakage current measuring device (pictured below)



1 millivolt = 1 microamp

Chassis or Earth Leakage

1. Set the DVM to AC volts (200 mV) and connect the leakage current measuring device.
2. Turn on the system.
3. Measure between the chassis and earth ground.
4. Determine the leakage current using the conventional 1 µA for each 1 mV.
5. Verify under normal conditions (ground closed, normal polarity) the leakage current is less than 300 µA. If the leakage current is greater than 300 µA, contact Covidien Technical Service (see page 10-6).
6. Verify that in single fault conditions (open neutral) the leakage current is less than or equal to 1000 µA. If the leakage current is greater than 1000 µA, contact Covidien Technical Service (see page 10-6).

Total Patient Leakage Source Current

1. Set the DVM to AC volts (200 mV) and connect the leakage current test circuit.
2. Turn on the system.
3. Measure between all the output receptacles (including the Patient Return Electrode receptacle) and earth ground. Record the largest reading.
4. Determine the leakage current using the conventional 1 µA for each 1 mV.
5. Verify that under normal conditions (ground closed, normal polarity) the leakage current is less than 10 µA. If the leakage current is greater than 10 µA, contact Covidien Technical Service (see page 10-6).
6. Verify that in single fault conditions (ground open) the leakage current is less than or equal to 50 µA. If the leakage current is greater than 50 µA, contact Covidien Technical Service (see page 10-6).

Total Patient Leakage Sink Current

1. Set the DVM to AC volts (200 mV) and connect the leakage current test circuit.
2. Turn on the system and connect the end of the leakage current test circuit to mains voltage through a 120 Ω, ¾ W resistor.
3. Connect the other side of the IEC leakage load to all of the output receptacles (including the Patient Return Electrode receptacle)
4. Determine the leakage current using the conventional 1 µA for each 1 mV.
5. Verify that the leakage current is less than or equal to 50 µA. If the leakage current is greater than 50 µA, contact Covidien Technical Service (see page 10-6).

Ground Continuity Testing

1. Connect the system to a ground continuity tester or a digital multimeter (DMM).
2. Test between the equipotential ground lug on the rear of the system and the supplied Covidien power cord, or directly to the middle ground pin of the inlet receptacle.
3. Initiate the test according to IEC standards.
4. Maximum permissible values are 0.3 ohms using a Covidien-supplied power cord or 0.2 ohm connected directly to the middle pin of the inlet receptacle. If the specifications are not met, contact Covidien Technical Service (see page 10-6).

Preventive Maintenance Check Sheet

Unit Serial Number	Date of Maintenance

Initial Inspection

Rear-panel inspection	Accept Y or N
Front-panel inspection	Accept Y or N
Foot-pedal inspection	Accept Y or N
Power-cord inspection	Accept Y or N
Internal-component inspection (if applicable)	Accept Y or N

Power Up Check

System self-check	Accept Y or N
Handswitch activation	Accept Y or N
Foot-pedal activation	Accept Y or N
Auto Bipolar activation	Accept Y or N
Tone audible at high and low ranges	Accept Y or N

Power Output

Testing COAG output Monopolar 1 – 500 Ω

Power Setting	Energy Mode	Specifications	Reading	Pass/Fail
120 W	SPRAY	424 to 570 mA		P / F

Testing COAG output Monopolar 2 – 500 Ω

Power Setting	Energy Mode	Specifications	Reading	Pass/Fail
120 W	SPRAY	424 to 570 mA		P / F
10 W	SPRAY	101 to 181 mA		P / F
30 W	FULGURATE	205 to 285 mA		P / F

Testing COAG output Monopolar 2 – 100 Ω

Power Setting	Energy Mode	Specifications	Reading	Pass/Fail
120 W	SOFT	948 to 1274 mA		P / F

Testing CUT output Monopolar 2 – 300 Ω

Power Setting	Energy Mode	Specifications	Reading	Pass/Fail
10 W	PURE	143 to 223 mA		P / F
300 W	PURE	865 to 1163 mA		P / F
200 W	BLEND	707 to 949 mA		P / F

Testing VALLEYLAB mode output Monopolar 2 – 300 Ω

Power Setting	Energy Mode	Specifications	Reading	Pass/Fail
75 W	VALLEYLAB	433 to 581 mA		P / F

Bipolar output – 100 Ω

Power Setting	Energy Effect	Specifications	Reading	Pass/Fail
95 W	Bipolar HIGH	843 to 1133 mA		P / F
40 W	Bipolar MEDIUM	547 to 735 mA		P / F
15 W	Bipolar LOW	335 to 450 mA		P / F

Testing LigaSure/Bipolar output

Power Setting	Energy Effect	Specifications	Reading	Pass/Fail
Effect 6	Bipolar Resection - COAG	1145 to 1538 mA		P / F
Effect 6	Bipolar Resection - CUT	547 to 735 mA		P / F
5 W	LigaSure	276 to 357 mA		P / F
350 W	LigaSure	1940 to 2740 mA		P / F

REM Function

Receive a green indicator at 100 Ω	Accept Y or N
Measured impedance within 93 Ω to 107 Ω	Accept Y or N
Measured impedance within 43 Ω to 57 Ω	Accept Y or N
Receive a red indicator at 0 Ω	Accept Y or N
Measured impedance within 0 Ω to 4 Ω	Accept Y or N
Open Circuit REM Measurement less than 2000 Ω	Accept Y or N

Cross Coupling

Energy Channel Tested	Energy Mode/ Effect	Specifications	Reading	Pass/Fail
Monopolar 1	Bipolar Resection CUT	0 to 150 mA		P / F
	Bipolar HIGH	0 to 150 mA		P / F
	Mono 2 SPRAY	0 to 150 mA		P / F
	Mono 2 Pure	0 to 150 mA		P / F
Monopolar 2	Mono 1 Pure	0 to 150 mA		P / F
	Mono 1 SPRAY	0 to 150 mA		P / F
	Bipolar HIGH	0 to 150 mA		P / F
	Bipolar Resection CUT	0 to 150 mA		P / F
Bipolar	Bipolar Resection CUT	0 to 50 mA		P / F
	Mono 2 SPRAY	0 to 50 mA		P / F
	Mono 1 Pure	0 to 50 mA		P / F
LigaSure/Bipolar	Mono 1 Pure	0 to 50 mA		P / F
	Bipolar HIGH	0 to 50 mA		P / F
	Mono 2 SPRAY	0 to 50 mA		P / F

High-Frequency Leakage

Power	Energy Mode/ Effect	Specifications	Reading	Pass/Fail
Monopolar 1 Leakage	SPRAY	0 to 100 mA		P / F
Patient Return Leakage	SPRAY	0 to 100 mA		P / F
	PURE	0 to 100 mA		P / F
	BLEND	0 to 100 mA		P / F
	FULGURATE	0 to 100 mA		P / F
	SOFT	0 to 100 mA		P / F
	VALLEYLAB	0 to 100 mA		P / F
	SHARED SPRAY Dual	0 to 100 mA		P / F
Bipolar Leakage	HIGH (left tine)	0 to 69 mA		P / F
	HIGH (right tine)	0 to 69 mA		P / F
LigaSure/Bipolar Leakage	LigaSure (left tine)	0 to 100 mA		P / F
	LigaSure (right tine)	0 to 100 mA		P / F
	Bipolar Resection - CUT (right tine)	0 to 100 mA		P / F
	Bipolar Resection - CUT (left tine)	0 to 100 mA		P / F
	Bipolar Resection - COAG (left tine)	0 to 100 mA		P / F
	Bipolar Resection - COAG (right tine)	0 to 100 mA		P / F

Safety Test in Accordance with IEC 60601-1

Power	Energy Mode/ Effect	Specifications	Reading	Pass/Fail
Earth Leakage	Normal Conditions	0 to 300 µA		P / F
	Open Neutral	0 to 1000 µA		P / F
Total Patient Leakage Source Current	Normal Conditions	0 to 50 µA		P / F
	Open Ground	0 to 100 µA		P / F
Total Patient Leakage Sink Current (Mains to applied parts)	Normal Conditions	0 to 100 µA		P / F
Ground Bond Test		0 to 0.3 ohms with power cord or 0 to 0.2 ohms without power cord		P / F

Chapter 7

Calibrations

This chapter describes how to calibrate the VLFT10GEN.

After unpacking or servicing the system, set up the system, perform any required calibration, and verify correct functionality (see Chapter 6, *Testing Setup and Functional Tests*).

If the system does not satisfactorily complete the power-on self-test, then cycle the system power. If the VLFT10GEN continues to fail the self-test, contact Covidien Technical Service.

Touchscreen Calibration

Covidien recommends that only qualified personnel calibrate the VLFT10GEN. Covidien defines qualified personnel as someone with experience in electrosurgical equipment repair, such as biomedical personnel, or individuals who have taken official Covidien training courses.

During calibration, the user verifies system-specific information and adjusts the information if necessary.

Calibration may be required when components are replaced. Refer to Chapter 9, *Replacement Procedures* to determine the level of required calibration.

Notice

Calibration must be performed on a non-conductive surface. Do not use antistatic bench-top mats. When performed on a conductive surface, calibration values may not be accurate.

After completing any calibration section, the system will reboot to the clinical screen to save the values.

Recommended test equipment:

- Stylus pencil (or equivalent)

1. Touch the Service/Settings button on the front panel.
2. Touch the **Service** button on the display.

Important

If the touchscreen is inoperable, the touchscreen calibration can be accessed by holding down the service button for 5–10 seconds, and following the on-screen instructions.

3. Enter password (423213) and select the **OK** button.
4. Touch the **Touchscreen Calibration Verification** button on the display.
5. Press **Start Calibration** in the display to calibrate the touchscreen. The generator will restart.
6. Using a stylus (or equivalent) gently tap the center of the cross-hair targets. Touch all targets.

Important

Touch and release the targets quickly. Holding the target down will interfere with accurate screen calibration.

7. Upon completion of the touchscreen calibration, the generator will restart.
8. After the generator has restarted, press **Start Verification** in the display to determine if the touchscreen has been properly calibrated.
9. Press **Next** to begin verification of the touchscreen calibration.
10. Using a stylus (or equivalent) gently tap the center of the highlighted targets as they appear on the display panel. The display will identify which targets were touched

correctly (indicated with a check mark), and which were touched incorrectly (indicated with an X).

11. When the touchscreen verification is complete, a new screen will summarize how many targets, if any, were missed.
12. If no targets were missed, there is no need to calibrate the touchscreen. You may exit the touchscreen verification/calibration screen by touching **OK**.
13. If any targets were missed, the screen provides the option to restart touchscreen verification, start touchscreen calibration, or exit the touchscreen verification/ calibration screen.
    - To exit the touchscreen verification/calibration screen, touch the **OK** button.
    - To restart the touchscreen verification, touch the **Restart Verification** button and repeat steps 10 through 13 in this section.
    - To start touchscreen calibration, touch the **Start Calibration** button and perform the following steps.

Energy Calibration

Covidien recommends that only qualified personnel calibrate the VLFT10GEN. Covidien defines qualified personnel as someone with experience in electrosurgical equipment repair, such as biomedical personnel, or individuals who have taken official Covidien training courses.

During calibration, the user verifies system-specific information and adjusts the information if necessary.

Calibration may be required when components are replaced. Refer to Chapter 9, *Replacement Procedures* to determine the level of required calibration.

Warning

Electric Shock Hazard When taking measurements or troubleshooting the system, take appropriate precautions, such as using isolated tools and equipment, using the "one hand rule", etc.

Electric Shock Hazard Do not touch any exposed wiring or conductive surfaces while the system is disassembled and energized. Never wear a grounding strap when working on an energized system.

Notice

When testing RF equipment, follow these test procedures. Keep test leads to the minimum length usable; lead inductance and stray capacitance can adversely affect readings. Carefully select suitable ground points to avoid ground loop error in measurements.

The accuracy of most RF instruments is approximately 1%–5% of full scale. Using uncompensated scope probes causes large errors when measuring high-voltage RF waveforms.

Calibration must be performed on a non-conductive surface. Do not use antistatic bench-top mats. When performed on a conductive surface, calibration values may not be accurate.

After completing any calibration section, the system will reboot to the clinical screen to save the values.

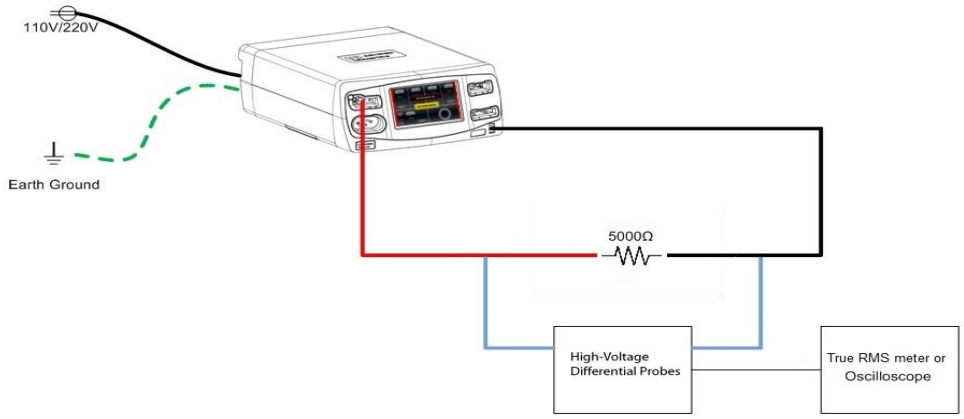
Required test equipment:

- 5 Ω, and 5000 Ω, all 250 W, 1% tolerance, non-inductive resistive loads
- Current transformer - 10 MHz bandwidth or greater
- True RMS meter or oscilloscope
- High-voltage differential probe - ± 5000 V or greater - 10 MHz bandwidth or greater
- REM plug
- Banana-plug style cables

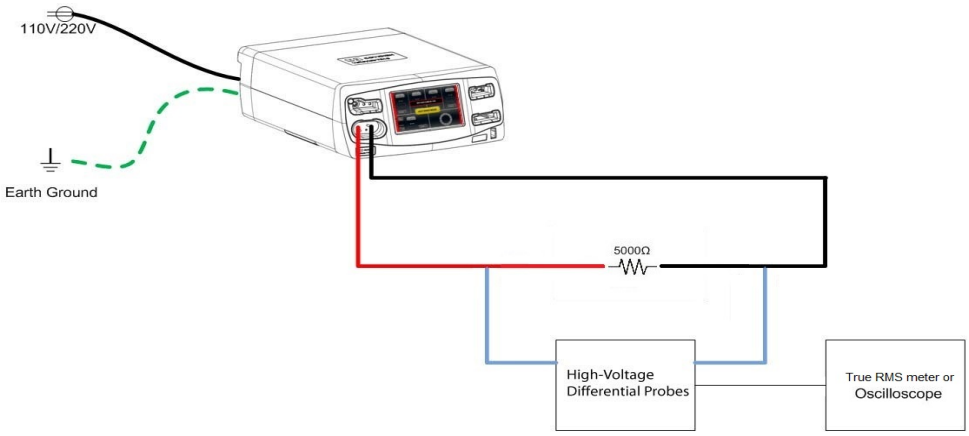
1. Select Service/Settings button on the front panel.
2. Touch the **Service** button on the display.
3. Enter password (423213) and select the **OK** button.
4. Touch **Energy Calibration** on the display.
5. Connect a cable from the left tine of the Monopolar 1 receptacle to one side of the 5000 Ω resistor.
6. Connect a cable from the shorted REM receptacle to the other side of the 5000 Ω resistor.
7. Connect the high-voltage differential probes to each side of the 5000 Ω resistor.

Important

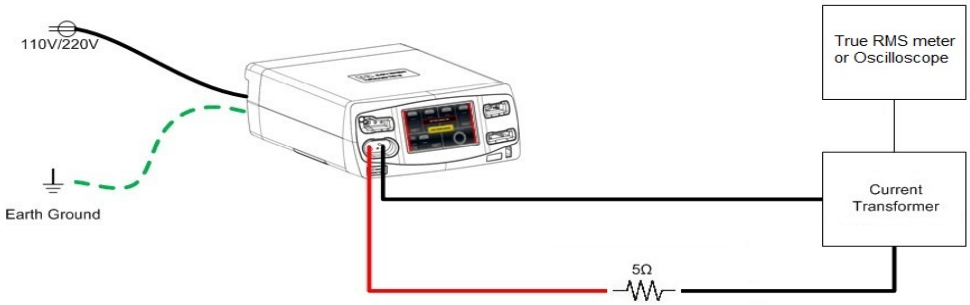
Configure the probe and oscilloscope scaling appropriately otherwise an incorrect calibration will result.



8. Press the **Start** button and adjust the output on the generator screen to move the RMS output measurement on the oscilloscope as close to the target as possible.
9. Once the target voltage is met, select the **Accept** button. The device will take measurements, then deactivate RF.
10. Select the **Next Step** button.
11. Repeat steps 8, 9, and 10 until all levels of calibration for Monopolar 1 are completed.
12. After completion of Monopolar 1, connect a cable from the left tine of the Bipolar receptacle to one side of the 5000 Ω resistor.
13. Connect a cable from the right tine of the Bipolar receptacle to the other side of the 5000 Ω resistor.
14. Connect the high-voltage differential probes to each side of the 5000 Ω resistor.



15. Repeat steps 8, 9, and 10 until all prompted steps of voltage calibration for Bipolar are completed.
16. After completion of Bipolar, connect a single cable from the left tine of the Bipolar receptacle to one side of the 5 Ω resistor.



17. Connect a cable from the right tine of the Bipolar receptacle, through the current transformer, to the other side of the 5 Ω resistor.
18. Press the **Start** button and adjust the output on the generator screen to move the RMS output measurement on the RMS voltage meter as close to the target as possible.
19. Once the target amperage is met, select the **Accept** button. The device will take measurements, then deactivate RF.
20. Select **Next Step** button.
21. Repeat steps 18, 19, and 20 until all levels of calibration for Bipolar are completed.
22. Accept the calibration values by selecting the **Save New Calibration** button.

    The system will automatically restart.

Important
If Energy Calibration is stopped before completion, the device will revert to the previous calibration settings.

Periodic Safety Check (Routine Maintenance)

Perform the following safety check once a year, or as directed in Chapter 8, to verify that the system is functioning properly. Record the test results for reference in future tests. Copy the check sheet at the end of this chapter for use in recording the results. Keep the completed check sheet for future reference. If the system fails to meet any of the checks, refer to Chapter 8, *Troubleshooting*.

Warning

Electric Shock Hazard When taking measurements or troubleshooting the system, take appropriate precautions, such as using isolated tools and equipment, using the "one hand rule", etc.

Electric Shock Hazard Do not touch any exposed wiring or conductive surfaces while the system is disassembled and energized. Never wear a grounding strap when working on an energized system.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

When testing RF equipment, follow these test procedures. Keep test leads to the minimum length usable; lead inductance and stray capacitance can adversely affect readings. Carefully select suitable ground points to avoid ground loop error in measurements.

The accuracy of most RF instruments is approximately 1%–5% of full scale. Using uncompensated scope probes causes large errors when measuring high-voltage RF waveforms.

Full definitions of the periodic safety checks are found throughout the remainder of this section. A summary of the periodic safety check is:

- Inspect the system and accessories
- Inspect the internal components (when required)
- System self-test
- Verify the audio
- Verify the power output
- Verify REM function
- Verify cross coupling
- Check leakage current and ground resistance

Inspecting the System and Accessories

Equipment list

- Monopolar foot pedal
- Bipolar foot pedal
- Ligasure foot pedal
- Monopolar instrument (preferred) or test leads
- Bipolar instrument cord (preferred) or test leads
- LigaSure instrument (preferred) or test leads

For a rear-panel inspection, turn off the system, and disconnect the power cord from the wall receptacle.

Rear Panel

1. Check the rear-panel foot pedal receptacles for obstructions or damage. Check for a secure fit by inserting the foot pedal connector into the Bipolar, Monopolar 1, Monopolar 2, and LigaSure/Bipolar foot pedal connectors.
2. If any foot pedal connector is damaged or unusable, return the system to Covidien Technical Service. For more information, see *Covidien Technical Service* on page 10-6.
3. Remove the fuse and verify correct voltage and current rating for usage environment. Refer to *Input Power* on page 4-3.

Front Panel

1. Turn on the generator and navigate to Demo Mode. See *DEMO Mode* on page 5-7.
2. Check the Monopolar 1 and Monopolar 2 instrument receptacles for obstructions or damage:
   - Insert a standard two-button pencil into the Monopolar 1 and Monopolar 2 receptacles to verify a secure fit
   - Insert a Force TriVerse electrosurgical pencil into the Monopolar 2 receptacle to verify a secure fit.
   - Verify the appropriate Monopolar quadrant on the display becomes active, indicating the instrument has been detected:
     – For the standard two-button electrosurgical pencil, the Standard Monopolar controls become active in the adjacent Monopolar quadrant.
     – For the Force TriVerse electrosurgical pencil, the Valleylab mode is available in the Monopolar 2 quadrant.
3. If either of the monopolar receptacles is damaged, contact Covidien Technical Service (see *Covidien Technical Service* on page 10-6).
4. Check the Patient Return Electrode (REM) receptacle for a broken pin or an obstruction.

5. If the REM receptacle is damaged or obstructed, contact Covidien Technical Service (see *Covidien Technical Service* on page 10-6).
6. Check the Bipolar instrument receptacle for obstructions or damage:
   - Insert the bipolar instrument or cable into the receptacle to verify a secure fit.
   - Verify the Bipolar quadrant on the touchscreen becomes active, indicating the instrument has been detected.
7. If the bipolar receptacle is damaged, return the system to Covidien Technical Service (see *Covidien Technical Service* on page 10-6).
8. Check the LigaSure/Bipolar receptacle for obstructions or damage:
   - Insert a compatible LigaSure instrument into receptacle to ensure a secure fit.
   - Verify the LigaSure quadrant of the touchscreen becomes active, indicating the instrument has been detected:
9. If the LigaSure/Bipolar receptacle is damaged or the "Invalid Instrument" message appears, contact Covidien Technical Service (see *Covidien Technical Service* on page 10-6).

Foot Pedals

1. Remove the foot pedal from the system.
2. Inspect the connector and receptacle for damage or corrosion.
3. Inspect the foot pedal for damage.
4. Reconnect the foot pedal to the system.

Power Cord

1. Verify the cord is unplugged from the wall receptacle and remove the power cord from the system.
2. Inspect the power connector and receptacle for damage.
3. Inspect the power cord for damage.
4. Reconnect the power cord to the system.
5. Turn on the generator to test functionality.

Inspecting Internal Components (when required)

This section is only required when the system is open for troubleshooting, repair, or spare replacement.

Equipment list

- Torx T30 screwdriver

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

1. Turn off power to the system and remove the power cord from the wall outlet and the generator power cord receptacle.
2. Remove the four bolts that secure the cover to the chassis.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Slide the front and back bezels away from the main chassis to release the locking/alignment features.
4. Lift the cover off the chassis. Set the cover aside for reinstallation.
5. Remove the top E-PAC foam layer. Set aside the foam for reinstallation.
6. Verify that all connectors are firmly seated.
7. If further investigation is required, remove subsequent E-PAC foam layers and housed PCBAs.
8. Inspect each PCBA for damaged components or wires, cracks, and corrosion.
9. If there is evidence of damage on the Controller PCBA, Steering Relay PCBA, Front Panel, Footswitch PCBA, or the RF PCBA, contact Covidien Technical Service (see *Covidien Technical Service* on page 10-6).
10. Inspect the entire device for loose debris. If any debris exists, carefully remove the debris before proceeding.
11. Replace the cover using the four mounting bolts to secure.

Power Up Check

System Self Test

Turning on the system initiates an internal power-on self-test to verify the calibration. The self-test also checks the operation of the speaker, all indicators, and the display.

Warning

Use the system only if the power-on self-test has been completed as described. Otherwise, inaccurate power outputs may result.

1. There are two ways to run a system self-test:
   - If the System is OFF, turn on the system by pressing the **On/Off** button on the front panel.
   - If the system is ON, navigate to the system self-test screen by pressing the gears button on the front panel, touching the **System** button on the touchscreen, touching the **Diagnostics** button on the touchscreen, and then touching the **Self-Test** button on the touchscreen.
2. Verify the following:
   - All visual indicators and display on the front panel illuminate.
   - Test tones sound to verify that the speaker is working properly.
3. If the power-on self-test is successful, the following occurs:
   - The display illuminates and shows all 4 quadrants.
   - The REM alarm indicator illuminates.

   or
4. If the self-test is not successful, an alarm tone sounds. An error screen appears on the display. Note the information on this display and refer to Chapter 8, *Troubleshooting*.
5. Activate the monopolar instruments by pressing the handswitches to test functionality.
6. Set Auto Bipolar.
7. Activate the bipolar instrument by closing the tines to test functionality.
8. Activate the foot pedal with a corresponding instrument inserted to test functionality and confirm the audio tone.

Verifying the Audio

1. Press the **Audio** button on the front panel.
2. Press the **+ and -** buttons on the display. Verify that the audio is active after each +/- button press and is distortion free.

Chapter 8

Troubleshooting

Precaution

Read the instructions, warnings, and precautions provided with this energy platform and associated accessories before using. Specific instructions for electrosurgical instruments are not included in this manual.

General Troubleshooting Guidelines

If the VLFT10GEN malfunctions, check for obvious conditions that may have caused the problem:

- Check the system for visible signs of physical damage.
- Make sure the fuse drawer is tightly closed.
- Verify that all cords are connected and attached properly.
- If an error code is displayed on the touchscreen, note the code along with all information in the error log (See *Logs* on page 5-7) and use the information in this chapter to proceed.
- If the problem is still unclear, turn the VLFT10GEN off, wait 10 seconds before turning on again.

If the malfunction persists, the system may require service. Contact your institution's biomedical engineering department. Covidien Technical Service contact information is listed on page 10-6.

REM Alarms

If the VLFT10GEN does not sense the correct impedance for the connected REM Polyhesive patient return electrode, monopolar energy is disabled, the REM indicator on the front panel illuminates red, the REM message appears on the touchscreen, and an alarm tone sounds twice. After some time, the REM message disappears, the REM symbol appears and remains red, and RF energy remains disabled until the REM alarm is corrected.

When you correct a REM-alarm condition, the system is enabled and the REM-alarm indicator on the front panel illuminates green.

Precaution

Covidien REM Polyhesive patient return electrodes are recommended for use with the VLFT10GEN. Return electrodes from other manufacturers may not provide proper impedance to work correctly with the energy platform.

Notice

Alarm characteristics cannot be changed.

Correcting a REM-Alarm Condition

To correct a REM-alarm condition, follow these steps:

1. Inspect the return-electrode plug and cord. If there is evidence of cracks, breaks, or other visible damage, replace the return electrode and/or the cord.
2. Verify that the patient-return-electrode cord is correctly connected to the energy platform.

3. Verify that there is full contact between the patient and return electrode. Follow the instructions for use provided with the REM Polyhesive patient return electrode to ensure proper attachment.
4. If the REM alarm persists, it may be necessary to use more than one patient return electrode. Refer to the troubleshooting flow chart in the REM Polyhesive patient return electrode instructions for use for more detail.

Correcting Malfunctions

If a solution is not readily apparent, use the table below to help identify and correct specific malfunctions. After you correct the malfunction, verify that the system completes the self-test as described in Chapter 5, *System Setup*.

Situation	Possible Cause	Solution
Abnormal neuromuscular stimulation *(stop surgery immediately).*	Metal-to-metal sparking.	Check all connections to the energy platform, patient return electrode, and active electrodes.
	High settings used for the FULGURATE and SPRAY modes.	Use a lower power setting for the FULGURATE and the SPRAY modes.
	Abnormal 50–60 Hz leakage currents.	Contact your biomedical engineering department or a Covidien technical service representative for assistance.
Energy platform does not respond when turned on.	Disconnected power cord or faulty wall outlet.	Check power cord connections (energy platform and wall outlet). Connect the power cord to a functional outlet.
	Faulty power cord.	Replace the power cord.
	Fuse drawer is open or fuses are blown.	Replace the blown fuse(s). Close the fuse drawer. See Chapter 4, *Technical Specifications*.
	Internal component malfunction.	Use a backup energy platform. Contact your biomedical engineering department or a Covidien technical service representative for assistance.

Situation	Possible Cause	Solution
System is on, but did not complete the self-test.	Software malfunction.	Turn off the energy platform, then turn on.
	Internal component malfunction.	Note the code along with all information on the error screen. Note the number and refer to *System Errors* on page 8-8. Use a backup energy platform. Contact your biomedical engineering department or a Covidien technical service representative for assistance.
Energy platform is on and instrument is activated, but system does not deliver output.	Malfunctioning foot pedal or handswitching instrument.	Turn off the energy platform. Check and correct all instrument connections. Turn on the energy platform. Replace the instrument if it continues to malfunction.
	Power is set too low or turned off.	Increase the power setting.
	An alarm condition exists.	Note the code along with all information on the error screen. Refer to *System Errors* on page 8-8. In case of a REM alarm, refer to *Correcting a REM-Alarm Condition* on page 8-2.
	Internal component malfunction.	Contact your biomedical engineering department or a Covidien technical service representative for assistance.
	System does not detect tissue-fusion instrument.	Firmly insert the LigaSmart connector into the appropriate receptacle on the energy platform front panel. Ensure the LigaSure quadrant indicates that it has detected the instrument.

Situation	Possible Cause	Solution
	System does not detect monopolar instrument.	Firmly insert the monopolar connector into the appropriate receptacle on the energy platform front panel. Ensure the associated Monopolar quadrant indicates that it has detected the instrument.
	System does not detect bipolar instrument.	Firmly insert the bipolar connector into the appropriate receptacle on the energy platform front panel. Ensure the Bipolar quadrant indicates that it has detected the instrument.
Continuous monitor interference.	Malfunctioning monitor.	Replace the monitor.
	Faulty chassis-to-ground connections.	Check and correct the chassis ground connections for the monitor and for the energy platform. Check other electrical equipment in the room for defective grounds.
	Electrical equipment is grounded to different objects rather than a common ground. The energy platform may respond to the resulting voltage differences between grounded objects.	Plug all electrical equipment into line power at the same location. Contact your biomedical engineering department or a Covidien technical service representative for assistance.

Situation	Possible Cause	Solution
Interference with other devices only when the energy platform is activated.	Metal-to-metal sparking.	Check all connections to the energy platform, patient return electrode, and instruments.
	High settings used for the FULGURATE and SPRAY modes	Use lower power settings for the FULGURATE and SPRAY modes.
	Electrically inconsistent ground wires in the operating room.	Verify that all ground wires are as short as possible and go to the same grounded metal.
	If interference continues when the energy platform is activated, the monitor is responding to radiated frequencies.	Ask your biomedical engineering department to check with the manufacturer of the monitor. Some manufacturers offer RF choke filters for use in monitor leads. The filters reduce interference when the energy platform is activated and minimize the potential for an electrosurgical burn at the site of the monitor electrode.

Situation	Possible Cause	Solution
Pacemaker interference.	Intermittent connections or metal-to-metal sparking.	Check the active and patient return electrode cord connections. It may be necessary to reprogram the pacemaker.
	Current traveling from active to return electrode during monopolar electrosurgery is passing too close to pacemaker.	Consult the pacemaker manufacturer or hospital cardiology department for further information when use of electrosurgical appliances is planned in patients with cardiac pacemakers. Use bipolar instruments, if possible. If you must use a monopolar instrument, place the patient return electrode as close as possible to the surgical site. Make sure the current path from the surgical site to the patient return electrode does not pass through the vicinity of the heart or the site where the pacemaker is implanted. Always monitor patients with pacemakers during surgery and keep a defibrillator available.
Internal Cardiac Defibrillator (ICD) activation.	ICD is activated by energy platform.	Stop the procedure and contact the ICD manufacturer for instructions.
Touchscreen button does not respond to touch.	Touchscreen is out of calibration.	Request biomedical department to perform touchscreen calibration as described in the service manual.
	Touchscreen is broken.	Request biomedical department to replace the touchscreen as described in the service manual.

System Errors

Most system errors require some action on the user's part to correct the condition; however, some are corrected automatically. Use the following list to determine how to correct an error condition.

After correcting the error condition, verify that the system completes the self-test as described in Chapter 5, *System Setup*.

All errors are classified as Technical Alarm Conditions in IEC 60601-1-8, with the exception of E402, E403, E404, E405, E419, E422, and E426 (classified as Other Alarm Conditions).

Note: Alarm priorities marked with * signify a high priority if the error is discovered during POST, and medium priority if the error occurs at any time outside of POST.

Error Codes

Error Code	Title	Description	Troubleshooting	Possible Source(s)	Alarm Priority
E101	System Error	FPGA Failure	Contact Biomed	Controller PCBA	High Priority
E102	System Error	CPLD Failure	Contact Biomed	Controller PCBA	High Priority
E103	System Error	FPGA Failure	Contact Biomed	Controller PCBA	High Priority
E104	System Error	Boot Sector Failure	Contact Biomed	Controller PCBA	High Priority
E105	System Error	RAM Test Failure	Contact Biomed	Controller PCBA	High Priority
E106	System Error	Processor Exception	Contact Biomed	Controller PCBA	High Priority
E107	System Error	Unexpected Interrupt	Contact Biomed	Controller PCBA	High Priority
E201	System Error	Storage Failure	Contact Biomed	Controller PCBA	High Priority
E202	System Error	RTOS Failure	Contact Biomed	Controller PCBA	High Priority
E203	System Error	OS Failure	Contact Biomed	Controller PCBA	High Priority
E204	System Error	Assert Error	Contact Biomed	Controller PCBA	High Priority
E205	System Error	Null Pointer Error	Contact Biomed	Controller PCBA	High Priority

Error Code	Title	Description	Troubleshooting	Possible Source(s)	Alarm Priority
E206	System Error	Database Error	Contact Biomed	Controller PCBA	High Priority
E207	System Error	Mem Allocate Error	Contact Biomed	Controller PCBA	High Priority
E208	System Error	Stack Overflow	Contact Biomed	Controller PCBA	High Priority
E209	System Error	DMA Failure	Contact Biomed	Controller PCBA	High Priority
E210	System Error	Thread Limit Error	Contact Biomed	Controller PCBA	High Priority
E211	System Error	Internal Messaging Error	Contact Biomed	Controller PCBA	High Priority
E212	System Error	PCBA Failure	Contact Biomed	Controller PCBA	High Priority
E213	System Error	SR PCBA Failure	Contact Biomed	Steering Relay PCBA	High Priority
E214	System Error	RF PCBA Failure	Contact Biomed	RF PCBA	High Priority
E215	System Error	Software State Error	Contact Biomed	Controller PCBA	High Priority
E216	System Error	Low Voltage Rail Failure	Contact Biomed	Controller PCBA, Power Supply	High Priority
E217	System Error	High Voltage Rail Failure	Contact Biomed	Controller PCBA, Power Supply	High Priority
E218	System Error	Display Driver Error	Contact Biomed	Controller PCBA	High Priority
E219	System Error	Audio Circuit Failure	Contact Biomed	Controller PCBA	High Priority
E220	System Error	Multi-tasking Error	Contact Biomed	Controller PCBA	High Priority
E221	System Error	Processor Timebase Error	Contact Biomed	Controller PCBA	High Priority

Error Code	Title	Description	Troubleshooting	Possible Source(s)	Alarm Priority
E222	System Error	Processor Timebase Error	Contact Biomed	Controller PCBA	High Priority
E223	System Error	FPGA Timebase Error	Contact Biomed	Controller PCBA	High Priority
E224	System Error	System Timebase Error	Contact Biomed	Controller PCBA	High Priority
E225	System Error	Processor Watchdog Error	Contact Biomed	Controller PCBA	High Priority
E226	System Error	FPGA Comm Error	Contact Biomed	Controller PCBA, Steering Relay PCBA	High Priority
E227	System Error	REM Circuit Failure	Contact Biomed	Steering Relay PCBA	High Priority
E228	System Error	Relay Feedback Failure	Contact Biomed	Steering Relay PCBA	High Priority
E229	System Error	Connector Diagnostic Failure	Contact Biomed	Cable Connection	High Priority
E230	System Error	Critical Data Failure	Contact Biomed	Controller PCBA	High Priority
E231	System Error	Security Access Error	Contact Biomed	Controller PCBA	High Priority
E232	Configuration Mismatch	Invalid System Configuration	Dock to Valleylab Exchange	Any	High Priority
E233	Configuration Mismatch	Field Replaceable Unit Updated	Dock to Valleylab Exchange	Any	High Priority
E234	System Error	Processor Comm Failure	Contact Biomed	Controller PCBA	High Priority

Error Code	Title	Description	Troubleshooting	Possible Source(s)	Alarm Priority
E235	REM Pad Contact Quality	None	• Connect REM pad • Check connection at patient site • Replace REM pad	N/A	Medium Priority
E236	System Error	Processor Watchdog Error	Contact Biomed	Controller PCBA	High Priority
E238	System Error	Software Failure	Contact Biomed	Controller PCBA	High Priority
E239	System Error	Software Failure	Contact Biomed	Controller PCBA	High Priority
E240	System Error	Thread Check Failure	Contact Biomed	Controller PCBA	High Priority
E241	System Error	RF Data Error	Contact Biomed	Controller PCBA	High Priority
E242	System Error	RF Data Timing Error	Contact Biomed	Controller PCBA	High Priority
E243	System Error	RF Data Delay Error	Contact Biomed	Controller PCBA	High Priority
E244	System Error	RF Interrupt Error	Contact Biomed	Controller PCBA	High Priority
E246	System Error	HWC Control Selection Error	Contact Biomed	Controller PCBA	High Priority
E247	System Error	PS PCBA Failure	Contact Biomed	Controller PCBA	High Priority
E248	System Error	FP PCBA Failure	Contact Biomed	Controller PCBA	High Priority
E301	Internal Check	Network Diagnostic Issue	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Controller PCBA	High Priority Medium Priority*

Error Code	Title	Description	Troubleshooting	Possible Source(s)	Alarm Priority
E302	Internal Check	Mono 1 Port Comm Issue	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Steering Relay PCBA	High Priority Medium Priority*
E303	Internal Check	Mono 2 Port Comm Issue	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Steering Relay PCBA	High Priority Medium Priority*
E304	Internal Check	Bipolar Port Comm Issue	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Steering Relay PCBA	High Priority Medium Priority*
E305	Internal Check	LigaSure Port Comm Issue	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Steering Relay PCBA	High Priority Medium Priority*
E306	Internal Check	Instrument Scanner Issue	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Controller PCBA, Display PCBA	Medium Priority
E307	Internal Check	Unsupported Command	Press to dismiss	Controller PCBA	Medium Priority

Error Code	Title	Description	Troubleshooting	Possible Source(s)	Alarm Priority
E308	Internal Check	Software Timeout Issue	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Controller PCBA	Medium Priority
E309	Internal Check	Activation Timing Issue	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Controller PCBA	Medium Priority
E310	Touchscreen Error	Unintentional Screen Input	• Inspect Touchscreen • If message reappears, contact Biomed	Display PCBA, Chassis	Medium Priority
E312	Internal Check	Absolute Integrated Error	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Controller PCBA, Steering Relay PCBA, RF PCBA, Software Calibration, None	High Priority Medium Priority*
E313	Internal Check	Voltage Sensor Compare Error	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Controller PCBA, Steering Relay PCBA, RF PCBA, Software Calibration, None	High Priority Medium Priority*
E314	Internal Check	Current Sensor Compare Error	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Controller PCBA, Steering Relay PCBA, RF PCBA, Software Calibration, None	High Priority Medium Priority*

Error Code	Title	Description	Troubleshooting	Possible Source(s)	Alarm Priority
E315	Internal Check	Power Sensor Compare Error	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Controller PCBA, Steering Relay PCBA, RF PCBA, Software Calibration, None	High Priority Medium Priority*
E316	Internal Check	Power Compare Error	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Controller PCBA, Steering Relay PCBA, RF PCBA, Software Calibration, None	High Priority Medium Priority*
E317	Internal Check	PVI Curve Compare Error	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Controller PCBA, Steering Relay PCBA, RF PCBA, Software Calibration, None	High Priority Medium Priority*
E318	Internal Check	Voltage Sensor Clip Error	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Controller PCBA, Steering Relay PCBA, RF PCBA, Software Calibration, None	High Priority Medium Priority*
E319	Internal Check	Current Sensor Clip Error	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Controller PCBA, Steering Relay PCBA, RF PCBA, Software Calibration, None	High Priority Medium Priority*

Error Code	Title	Description	Troubleshooting	Possible Source(s)	Alarm Priority
E320	Check Instrument	N/A	• Mono 1 handswitch pressed • Release switch • Replace instrument	Controller PCBA, Instrument	Medium Priority
E321	Check Foot Pedal	N/A	• Mono 1 foot pedal pressed • Release pedal • If issue persists, replace foot pedal	Controller PCBA, Steering Relay PCBA, Foot Pedal PCBA, Foot Pedal	Medium Priority
E322	Check Instrument	N/A	• Mono 2 handswitch pressed • Release switch • If issue persists, replace instrument	Controller PCBA, Steering Relay PCBA, Instrument	Medium Priority
E323	Check Foot Pedal	N/A	• Mono 2 foot pedal pressed • Release pedal • If issue persists, replace foot pedal	Controller PCBA, Steering Relay PCBA, Foot Pedal PCBA, Foot Pedal	Medium Priority
E324	Check Instrument	N/A	• Bipolar handswitch pressed • Release switch • If issue persists, replace instrument	Controller PCBA, Steering Relay PCBA, Instrument	Medium Priority

Error Code	Title	Description	Troubleshooting	Possible Source(s)	Alarm Priority
E325	Check Foot Pedal	N/A	• Bipolar foot pedal pressed • Release pedal • If issue persists, replace foot pedal	Controller PCBA, Steering Relay PCBA, Foot Pedal PCBA, Foot Pedal	Medium Priority
E326	Check Instrument	N/A	• LigaSure handswitch pressed • Release switch • If issue persists, replace instrument	Controller PCBA, Instrument	Medium Priority
E327	Check Foot Pedal	N/A	• LigaSure foot pedal pressed • Release pedal • If issue persists, replace foot pedal	Controller PCBA, Steering Relay PCBA, Foot Pedal PCBA, Foot Pedal	Medium Priority
E328	Unintentional Input	Panel Button Error	• Release front panel button • If message reappears, contact Biomed	Controller PCBA, Display, Chassis	Medium Priority
E329	Check Foot Pedal	Invalid Foot Pedal Input	• Release pedal • If issue persists, replace foot pedal	Steering Relay PCBA, Foot Pedal PCBA, Foot Pedal	Medium Priority
E330	Prolonged Activation	Prolonged Activation	• Internal check completed • Press to dismiss or reactivate • If message reappears, contact Biomed	Controller PCBA	Medium Priority
E331	Invalid Instrument	Invalid Instrument	Replace Instrument	Controller PCBA	Medium Priority

Error Code	Title	Description	Troubleshooting	Possible Source(s)	Alarm Priority
E332	System Issue	Chassis Over Temp Detected	Contact Biomed	Any	High Priority Medium Priority*
E333	System Issue	Cooling Fan Failure	Contact Biomed	Any	High Priority Medium Priority*
E334	REM Check Issue	REM Automated Check Error	• REM check completed • Press to dismiss or reactivate	Steering Relay PCBA	High Priority Medium Priority*
E335	System Issue	Driver Comm Issue	Contact Biomed	Controller PCBA	Medium Priority
E336	Internal Check	ADC Sync Issue	• Internal check completed • Press to dismiss or reactivate • If message reappears, contact Biomed	Controller PCBA, RF PCBA, Chassis	High Priority Medium Priority*
E337	Internal Check	Real Time Clock Issue	• Internal check completed • Press to dismiss or reactivate • If message reappears, contact Biomed	Controller PCBA	High Priority Medium Priority*
E339	Internal Check	RF Control Limit Check Issue	• RF Limit Error check completed • Press to dismiss or reactivate • If message reappears, contact Biomed	RF PCBA	Medium Priority

Error Code	Title	Description	Troubleshooting	Possible Source(s)	Alarm Priority
E340	Configuration Mismatch	Invalid Country Code	• LigaSure temporarily disabled • Contact Biomed • Dock to Valleylab Exchange	Controller PCBA	Medium Priority
E341	Internal Check	Panel Comm Issue	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Display PCBA, Chassis	High Priority Medium Priority*
E342	Internal Check	Foot Pedal Comm Issue	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Controller PCBA, Foot Pedal PCBA	High Priority Medium Priority*
E343	Internal Check	REM Comm Issue	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Controller PCBA, Steering Relay PCBA	High Priority Medium Priority*
E344	Internal Check	REM Comm Issue	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Controller PCBA, Steering Relay PCBA	High Priority Medium Priority*

Error Code	Title	Description	Troubleshooting	Possible Source(s)	Alarm Priority
E345	Internal Check	REM Comm Issue	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Controller PCBA, Steering Relay PCBA	High Priority Medium Priority*
E346	Internal Check	REM Comm Issue	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Controller PCBA, Steering Relay PCBA	High Priority Medium Priority*
E347	Internal Check	REM Data Issue	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Controller PCBA, Steering Relay PCBA	High Priority Medium Priority*
E348	Internal Check	Software Assert Issue	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Controller PCBA	Medium Priority
E349	Internal Check	Thread Check Issue	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Controller PCBA	Medium Priority
E350	Internal Check	Return Electrode Overtemp	• Allow cooling time • Reactivate instrument	N/A	Medium Priority

Error Code	Title	Description	Troubleshooting	Possible Source(s)	Alarm Priority
E351	System Issue	Processor Watchdog Error	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Steering Relay PCBA	Medium Priority
E352	Internal Check	Software Update Issue	Contact Biomed	Controller PCBA	Medium Priority
E353	System Issue	Touchscreen Calibration Reset	Contact Biomed	Controller PCBA, Display PCBA	Medium Priority
E354	Internal Check	SWC Target Variance	• Internal check completed • Press to dismiss • If message reappears, contact Biomed	Controller PCBA	High Priority Medium Priority*
E355	Invalid Activation	Foot Pedal Not Supported	• Press to dismiss • Reactivate instrument • Activation from instrument only	Controller PCBA, Foot Pedal PCBA	Medium Priority
E356	System Error	Invalid RF Calibration	Perform Energy Calibration	N/A	Medium Priority
E401	Authorization Issue	Invalid Pairing Code	Press to dismiss	Controller PCBA	Low Priority
E402	Incomplete Seal Cycle	Hold until complete seal cycle	• Inspect seal • Press activation button	N/A	Information Signal
E403	Incomplete Seal Cycle	Reactivate instrument	• Inspect seal • Check for metal clips/staples • Remove excess fluids	N/A	Information Signal

Error Code	Title	Description	Troubleshooting	Possible Source(s)	Alarm Priority
E404	Incomplete Seal Cycle	Reactivate instrument	• Inspect seal • Grasp thicker tissue • Fully close instrument handle	N/A	Information Signal
E405	Incomplete Seal Cycle	Reactivate instrument	• Inspect seal • Remove excess fluids • Clean and dry jaws	N/A	Information Signal
E407	Instrument Not Ready	N/A	• Dual modality instrument. • Insert other plug into Mono 2 receptacle.	N/A	Medium Priority
E408	Instrument Not Ready	N/A	• Dual modality instrument. • Insert other plug into LigaSure receptacle.	N/A	Medium Priority
E411	Invalid Activation Attempt	N/A	• Dual modality instrument. • Both plugs are required. Insert other plug into LigaSure receptacle.	N/A	Medium Priority
E412	Invalid Activation Attempt	N/A	• Dual modality instrument. • Both plugs are required. Insert other plug into Monopolar 2 receptacle.	N/A	Medium Priority

Error Code	Title	Description	Troubleshooting	Possible Source(s)	Alarm Priority
E413	Invalid Combination	N/A	• Instrument combination not allowed. • Remove current instrument in LigaSure receptacle.	N/A	Medium Priority
E414	Invalid Combination	N/A	• Instrument combination not allowed. • Remove current instrument in Monopolar 2 receptacle.	N/A	Medium Priority
E415	Feature Not Enabled	N/A	• The Bipolar Resection feature is not enabled. • Contact Covidien to enable this feature.	N/A	Medium Priority
E416	Unknown Instrument	N/A	• Instrument not recognized. • Replace instrument.	N/A	Medium Priority
E419	Incomplete Setup	N/A	• Separate forceps tips • Remove from tissue • Remove from fluids	N/A	Information Signal
E420	Usage Limit	N/A	The inserted device has already been used. It has not been recertified by the original manufacturer.	N/A	Medium Priority

Error Code	Title	Description	Troubleshooting	Possible Source(s)	Alarm Priority
E421	Usage Limit	N/A	The inserted device has already been used. It has not been recertified by the original manufacturer.	N/A	Medium Priority
E422	Incomplete Setup	N/A	• Check cable insertion • Separate forceps tips • Remove from tissue	N/A	Information Signal
E424	Activation Time Exceeded	N/A	• Remove from tissue • Separate forceps tips • Remove from fluids	N/A	Information Signal
E425	Contact Time Exceeded	N/A	• Remove from tissue • Separate forceps tips • Remove from fluids	N/A	Information Signal
E426	Incomplete Setup	N/A	Check cable insertion.	N/A	Information Signal

Chapter 9

Replacement Procedures

This chapter presents information on the replacement of components for the energy platform's top-level assemblies, front-panel assemblies, and rear-panel assemblies.

Tools Required for Component Replacement

The following are the tools needed to complete the replacement of VLFT10GEN components described in this chapter.

- Torx T-10 driver
- Torx T-30 driver
- #1 Phillips screwdriver
- 10 mm wrench
- #1 flathead screwdriver
- Valleylab Exchange

Notice

Upgrade to the latest version of Valleylab Exchange. If using v3.1.5, the following restrictions apply when replacing the Controller PCBA, Display PCBA, Power Supply, RF PCBA, Steering Relay PCBA, VIBE, or FTSW PCBA:

1. Replace only one component at a time.

2. Set the generator country code through Valleylab Exchange upon completion of the component replacement.

Touch-up Paint Instructions

The following instruction are to provide guidance on how to apply touch-up paint to the VLFT10GEN. The instructions are a guideline for the pre-cleaning requirements, safety concerns, and drying/environmental requirements. The material safety data sheet (MSDS) contains additional valuable information about the application of this product and should be read and followed before applying the touch-up paint.

Notice

Only use touch-up paint on fully assembled devices.

Pre-cleaning Requirements

Warm water should always be used for primary cleaning. If something stronger is needed, use a mild cleaning agent as recommended in *Cleaning* on page 10-3. Air-quality regulations in your area may limit the allowable emissions from cleaning operations.

Cleaning the Substrate

All surfaces to be coated must be free of dirt, grease, oil, oxidation, mill scale, and all other contaminates. The surface must be thoroughly dry before painting.

Touch-up Paint Safety

The touch-up paint contains organic solvents. Use adequate ventilation. Do not breath vapors or spray mists. Keep away from heat, sparks, and open flames. Avoid contact with eyes, skin, and clothing. Wash hands and equipment thoroughly after handling.

First Aid

- Eye contact – Flush immediately with plenty of water for at least 15 minutes. Seek medical attention.
- Skin contact – Wash thoroughly with soap and water for 5 minutes.
- If swallowed – Do not induce vomiting. Seek medical attention immediately.
- If inhaled – Remove to fresh air.

Drying Time

For air drying of the touched up area, the following drying time is suggested:

- Tack Free – 15 minutes
- Dry to handle – 2 Hours
- Full Cure – 7-10 days

Top-Level Assemblies

Base Chassis Replacement

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Remove the top level of E-PAC foam exposing the RF PCBA. Set the foam aside for reinstallation.
4. Remove the red/black power cable located near the power supply from the RF PCBA. Remove the 5 flex cable connectors from the side of the RF PCBA furthest from the power supply.
5. Remove the RF fan connector from the Controller PCBA.
6. Leaving the RF PCBA and RF fan in the second level of E-PAC foam, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.
7. Locate the power-supply fan directly behind the power supply. Remove the wire harness from the P8 connector on the Controller PCBA. Locate the Ladder flex cable connector opposite the power supply and remove the connector from J7 on the Steering PCBA.
8. Locate the 5 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, and P1 on the Steering Relay PCBA. Remove the front-panel assembly and set aside for reinstallation.

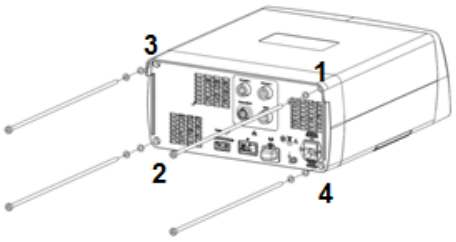
9. Remove the power-supply fan connector from the Controller PCBA.
10. Leaving the power-supply fan and Steering Relay PCBA in the third layer of E-PAC, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.
11. Locate and remove the four wire harnesses from P9, P7, J9, and P4 from the Controller PCBA near to the power supply. Locate and remove the fan connector from the side of the Controller PCBA furthest from the power supply on connector P1.
12. Locate and remove the Ladder flex cable from the J2 connector on the side of the Controller PCBA furthest from the power supply. Set aside for reinstallation.
13. Using a T-10, remove the fastener holding the braided ground wire to the Controller PCBA. Set aside for reinstallation.

Notice

Before removing the Controller PCBA, ensure that the braided ground wire is removed from the Controller PCBA. Failure to remove the braided cable can lead to irreparable damage to the PCBA, ground connection, and/or the power supply.

14. Leaving the controller fan and Controller PCBA in the third layer of E-PAC, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.
15. Locate and remove the blue/brown/green connector from the rear of the device connected to the J1 connector on the rear of the power supply. Set aside for reinstallation.
16. Locate and remove the power supply from the chassis. Set aside for reinstallation.
17. Using a T-10, remove the grounding wires from behind where the power supply was mounted. Set all aside for reinstallation.
18. Using a T-10, remove all four feet on the chassis. Set aside fasteners and feet for reinstallation.
19. Locate and remove the replacement chassis from its packaging and set it on a smooth, level surface.
20. Using a T-10, replace the four feet onto the bottom of the chassis and torque to 5.0 in./lb.
21. Using a T-10, replace the ground wires to the grounding point behind where the power supply is to be installed ensuring that the green/yellow wire is installed first followed by the braided wire. Torque to 5.0 in./lb.
22. Install the power supply by orienting the supply so that the tab on the metal enclosure faces away from where the PCBA stack will be reinstalled. The three connectors J2, J3, and J4 should be facing the front of the device. Slide the power supply down until the standoffs come through the tab on the power supply.
23. Reconnect the blue/brown/green connector to the rear of the power supply and the 3 cables to the J2, J3, and J4 connectors.
24. Replace the 4th layer of E-PAC foam with the Controller PCBA and controller fan onto the chassis base ensuring that the fan is facing the rear of the device.

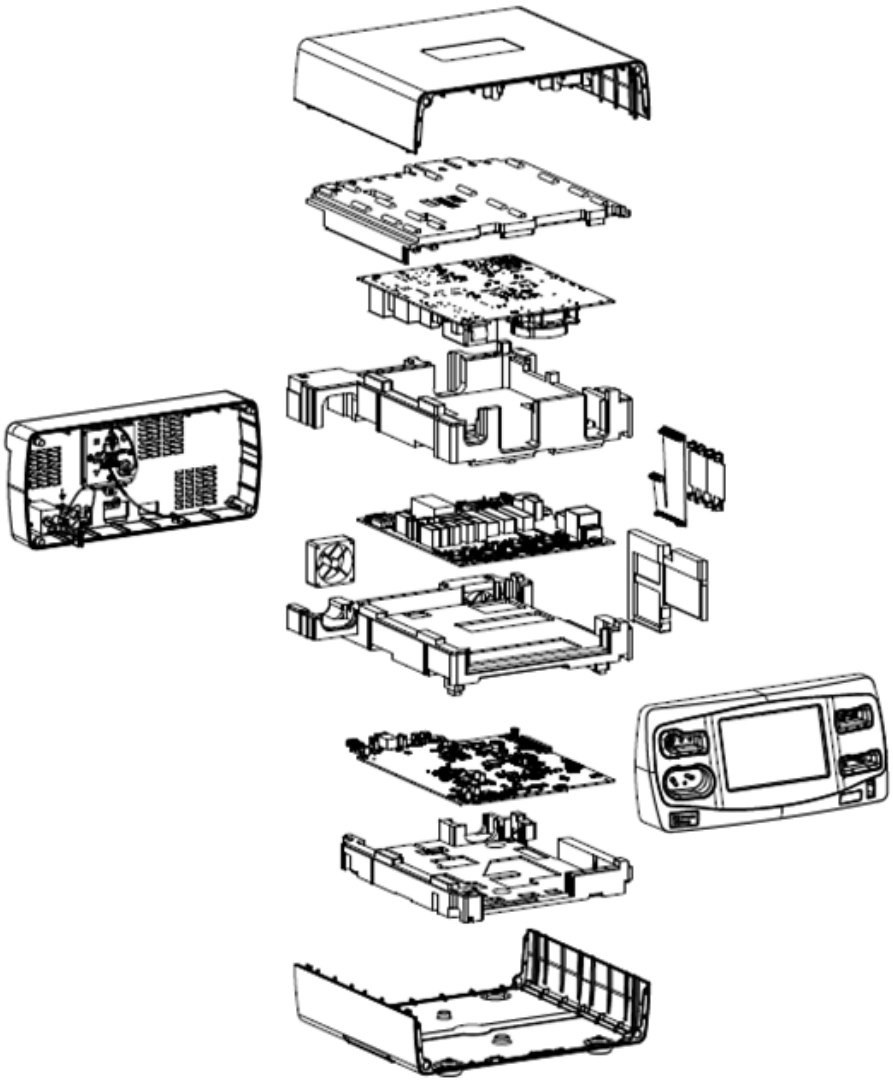
25. Using a T-10, replace the braided ground wire and screw. Torque the screw to 5.0 in./lb. of force.
26. Reconnect the Ladder cable to J2 as well as the P9, P7, J9, and P4 wire harnesses to their respective connection points. Reconnect the Controller PCBA fan to P1 as well.
27. Replace the 3rd layer of E-PAC foam with the Steering Relay PCBA and power-supply fan onto the Controller PCBA ensuring that the Controller PCBA fan slides into the E-PAC foam cutout on the 3rd level of foam. Reconnect the Ladder flex cable to J7 on the Steering PCBA, the power-supply fan to J8, and all five connections for the front panel P510, P511, P508, P509, and P1 on the Steering Relay PCBA.
28. Replace the 2nd layer of E-PAC foam with the RF PCBA and RF fan onto the Steering Relay PCBA foam ensuring that the power-supply fan slides into the E-PAC foam cutout on the 2nd level of foam. Reconnect the red/black power connector, 5 flex cable connectors, and RF fan connector.
29. Replace the top level of E-PAC foam onto the RF PCBA ensuring that the slots in the top level of foam align with the foam nubs from the 2nd layer of E-PAC foam.
30. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

31. Tighten the bolts to 15 in./lb. of force.
32. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.



Controller Fan Replacement

Equipment needed

- Torx T-10 driver
- Torx T-30 driver

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Remove the top level of E-PAC foam exposing the RF PCBA. Set the foam aside for reinstallation.
4. Remove the red/black power cable located near the power supply from the RF PCBA. Remove the 5 flex cable connectors from the side of the RF PCBA furthest from the power supply.
5. Leaving the RF PCBA and RF fan in the second level of E-PAC foam, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.
6. Locate the power-supply fan directly behind the power supply. Remove the wire harness from the P8 connector on the controller PCBA. Locate the Ladder flex cable connector opposite the power supply and remove the connector from J7 on the Steering PCBA.
7. Locate the 5 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, and P1 on the Steering Relay PCBA. Remove the front-panel assembly and set aside for reinstallation.

8. Leaving the power-supply fan and Steering Relay PCBA in the third layer of E-PAC, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.
9. Locate and remove the fan connector from the side of the Controller PCBA furthest from the power supply on connector P1.
10. Lift and remove the fan from the E-PAC.

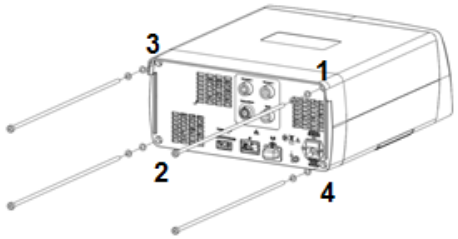
Warning

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

11. Locate and remove the replacement fan from the packaging. Orient the fan so that the power cable so that it is facing up and the fan is blowing out or towards the rear of the device.
12. Reconnect the Controller PCBA fan to P1.
13. Replace the 3rd layer of E-PAC foam with the Steering Relay PCBA and power-supply fan onto the Controller PCBA ensuring that the Controller PCBA fan slides into the E-PAC foam cutout on the 3rd level of foam. Reconnect the Ladder flex cable to J7 on the Steering PCBA, the power-supply fan to J8, and all five connections for the front panel P510, P511, P508, P509, and P1 on the Steering PCBA.
14. Replace the 2nd layer of E-PAC foam with the RF PCBA and RF fan onto the Steering Relay PCBA foam ensuring that the power-supply fan slides into the E-PAC foam cutout on the 2nd level of foam. Reconnect the red/black power connector, 5 flex cable connectors, and RF fan connector.
15. Replace the top level of E-PAC foam onto the RF PCBA ensuring that the slots in the top level of foam align with the foam nubs from the 2nd layer of E-PAC foam.
16. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:

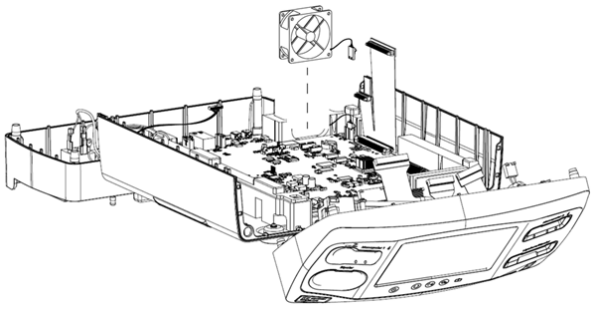


Bolt-tightening descriptions from the rear view:

- Top right

- Bottom left
- Top left
- Bottom right

17. Tighten the bolts to 15 in./lb. of force.



18. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

Controller PCBA Replacement

Equipment needed

- Torx T-10 driver
- Torx T-30 driver
- Valleylab exchange

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.

2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Remove the top level of E-PAC foam exposing the RF PCBA. Set the foam aside for reinstallation.
4. Remove the red/black power cable located near the power supply from the RF PCBA. Remove the 5 flex cable connectors from the side of the RF PCBA furthest from the power supply.
5. Leaving the RF PCBA and RF fan in the second level of E-PAC foam, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.
6. Locate the power-supply fan directly behind the power supply. Remove the wire harness from the P8 connector on the Controller PCBA. Locate the Ladder flex cable connector opposite the power supply and remove the connector from J7 on the Steering PCBA.
7. Locate the 5 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, and P1 on the Steering Relay PCBA. Remove the front-panel assembly and set aside for reinstallation.
8. Leaving the power-supply fan and Steering Relay PCBA in the third layer of E-PAC, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.
9. Locate and remove the four wire harnesses from P9, P7, J9, and P4 from the Controller PCBA near to the power supply. Locate and remove the fan connector from the side of the Controller PCBA furthest from the power supply on connector P1.
10. Locate and remove the Ladder flex cable from the J2 connector on the side of the Controller PCBA furthest from the power supply. Set aside for reinstallation.
11. Using a T-10, remove the fastener holding the braided ground wire to the Controller PCBA. Set aside for reinstallation.

Notice

Before removing the Controller PCBA, ensure that the braided ground wire is removed from the Controller PCBA. Failure to remove the braided cable can lead to irreparable damage to the PCBA, ground connection, and/or the power supply.

12. Remove the Controller PCBA by holding the edges of the PCBA from the E-PAC foam.

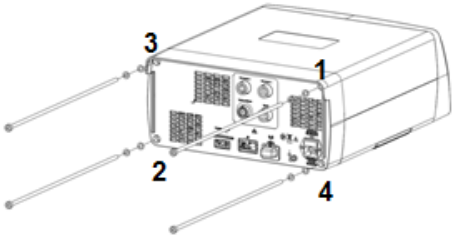
Warning

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

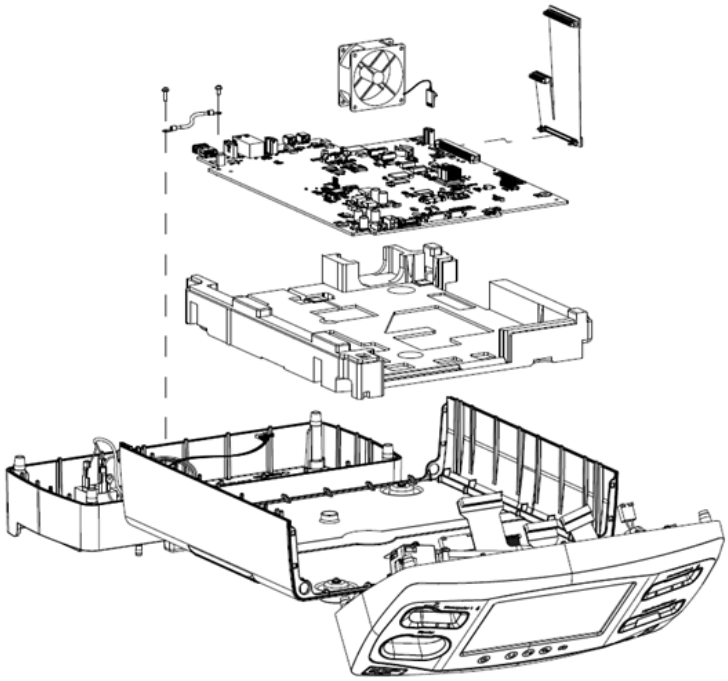
13. Locate and remove the replacement Controller PCBA from the protective ESD bag handling the PCBA only by the edges of the board. Orient the Controller PCBA so that the PCBA will slide down into the E-PAC foam.
14. Using a T-10, replace the braided ground wire and screw. Torque the screw to 5.0 in/lb. of force.
15. Reconnect the Ladder cable to J2 as well as the P9, P7, J9, and P4 wire harnesses to their respective connection points. Reconnect the Controller PCBA fan to P1 as well.
16. Replace the 3rd layer of E-PAC foam with the Steering Relay PCBA and power-supply fan onto the Controller PCBA ensuring that the Controller PCBA fan slides into the E-PAC foam cutout on the 3rd level of foam. Reconnect the Ladder flex cable to J7 on the Steering PCBA, the power-supply fan to J8, and all five connections for the front panel P510, P511, P508, P509, and P1 on the Steering Relay PCBA.
17. Replace the 2nd layer of E-PAC foam with the RF PCBA and RF fan onto the Steering Relay PCBA foam ensuring that the power-supply fan slides into the E-PAC foam cutout on the 2nd level of foam. Reconnect the red/black power connector, 5 flex cable connectors, and RF fan connector.
18. Replace the top level of E-PAC foam onto the RF PCBA ensuring that the slots in the top level of foam align with the foam nubs from the 2nd layer of E-PAC foam.
19. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

20. Tighten the bolts to 15 in./lb. of force.
21. Upon completion of the component replacement, follow the touchscreen calibration procedure outlined in this manual. See *Touchscreen Calibration* on page 7-2.
22. Upon completion of the touchscreen calibration, the system will issue an E337 error upon startup of the device and will persist until the generator is docked to the Valleylab Exchange to re-sync the clock.
23. Configure a computer with Valleylab Exchange installed to connect simultaneously to the generator and the Internet. Examples of this setup are:
    - Connecting the generator and computer to the Ethernet ports of a router.
    - Connecting a Wi-Fi adapter to your computer for Internet access and connecting the computer and generator with an Ethernet cable.
    - Configuring your computer's BIOS to allow simultaneous use of Wi-Fi and Ethernet connections.
24. Set up the generator and log into Valleylab Exchange as you would when updating software. See *Software Updates* on page 10-5. The generator clock will automatically re-sync as part of the docking workflow.
25. Select the **Set Serial Number** button on Valleylab Exchange.
26. When prompted, enter the generator serial number from the label on the back of the generator and click **Continue**.
27. After successful completion of the component setup and registration, the generator will automatically restart.
28. Verify that the E339 error does not appear when the generator has finished powering on. Press the service button on the front panel of the generator and verify that the clock is set to the correct time.
29. Follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.



PCBA Battery Replacement

Equipment needed

- Torx T-10 driver
- Torx T-30 driver
- #1 flathead screwdriver

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Remove the top level of E-PAC foam exposing the RF PCBA. Set the foam aside for reinstallation.
4. Remove the red/black power cable located near the power supply from the RF PCBA. Remove the 5 flex cable connectors from the side of the RF PCBA furthest from the power supply.
5. Leaving the RF PCBA and RF fan in the second level of E-PAC foam, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.
6. Locate the power-supply fan directly behind the power supply. Remove the wire harness from the P8 connector. Locate the Ladder ribbon cable connector opposite the power supply and remove the connector from J7.
7. Locate the 5 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, and P1. Remove the front-panel assembly and set aside for reinstallation.
8. Leaving the power-supply fan and Steering Relay PCBA in the third layer of E-PAC, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.
9. Locate the battery on the Controller PCBA and remove the battery. A small flathead screwdriver may be required.
10. Replace the battery with a new battery.

Warning

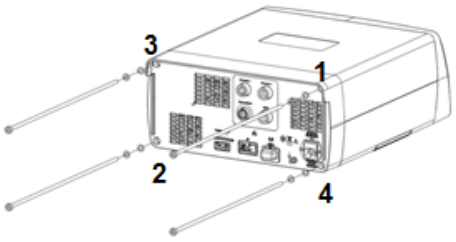
Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

11. Replace the third layer of E-PAC foam with the Steering Relay PCBA and power-supply fan on the Controller PCBA ensuring the Controller PCBA fan slides into the E-PAC foam cutout on the third level of foam. Reconnect the Ladder ribbon cable to J7, the power-supply fan to J8, and all five connections for the front panel P510, P511, P508, and P1.

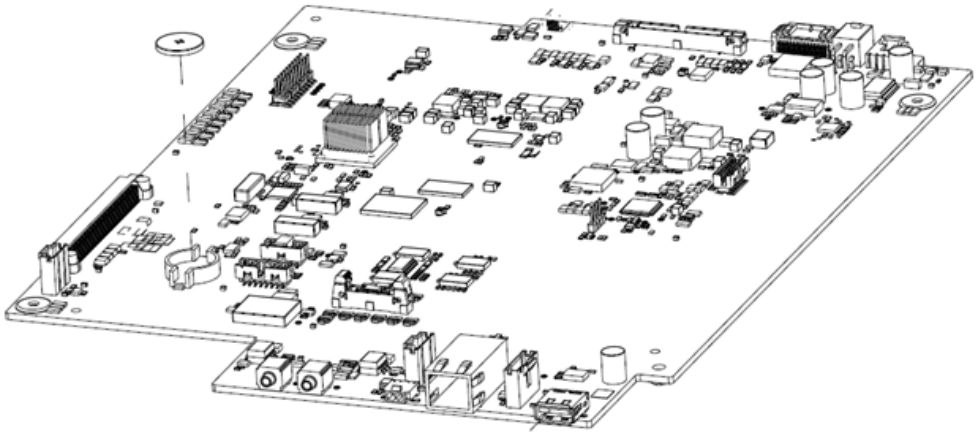
12. Replace the 2nd layer of E-PAC foam with the RF PCBA and RF fan onto the Steering Relay PCBA foam ensuring that the power-supply fan slides into the E-PAC foam cutout on the 2nd level of foam. Reconnect the red/black power connector, 5 ribbon-cable connectors, and RF fan connector.
13. Replace the top level of E-PAC foam onto the RF PCBA ensuring that the slots in the top level of foam align with the foam nubs from the 2nd layer of E-PAC foam.
14. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

15. Tighten the bolts to 15 in./lb. of force.



16. Upon completion of the battery replacement, the system will issue an E337 error upon startup of the device and will persist until the generator is docked to Valleylab Exchange to re-sync the clock.
17. Configure your computer with Valleylab Exchange installed to connect simultaneously to the generator and to the Internet. Examples of this setup are:

- Connecting the generator and computer to the Ethernet ports of a router.
- Connecting a Wi-Fi adapter to your computer for Internet access and connecting the computer and generator with an Ethernet cable.
- Configuring your computer's BIOS to allow simultaneous use of Wi-Fi and Ethernet connections.

18. Log into Valleylab Exchange as you would when updating software. See *Software Updates* on page 10-5. the generator clock will automatically re-sync as part of the docking workflow.
19. Turn the generator off, disconnect the Ethernet cable, and disconnect the power cord for at least 10 seconds.
20. Plug the power cord into the generator and turn on the power. Verify that the E339 error does not appear when the generator has finished powering on.
21. Press the service button on the front panel of the generator an verify that the clock is set to the correct time.
22. Upon completion of the clock re-sync, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

Display PCBA Replacement

Equipment needed

- Torx T-10 driver
- Torx T-30 driver
- Valleylab Exchange

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.

2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate the 6 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, P4, and P1 on the Steering Relay PCBA. Remove the front-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
4. Locate and remove the connectors from P4, P5, J2, P1, and P6 on the Display PCBA.
5. Using a T-10, remove the 2 screws holding the speaker bracket. Set them aside for reinstallation.
6. Using a T-10, remove the 3 screws holding the display PCBA to the LCD mount. Set them aside for reinstallation.
7. Remove the Display PCBA by holding the edges of the PCBA from the assembly.

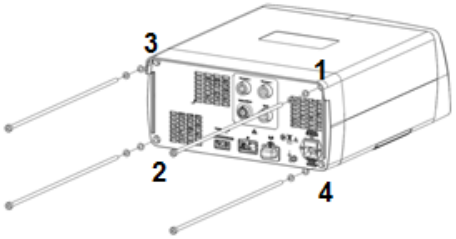
Warning

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

8. Locate and remove the replacement Display PCBA from the protective ESD bag handling the PCBA only by the edges of the board. Orient the Display PCBA so that the large P5 connector is facing the bottom of the assembly.
9. Using a T-10, replace the 3 screws to attach the Display PCBA to the LCD housing torquing the screw to 5.0 in./lb. of force.
10. Using a T-10, replace the two screws and speaker bracket.
11. Reconnect the connectors to P4, P5, J2, P1, P2, and P6 on the Display PCBA.
12. Orient the front-panel assembly so that it aligns with the top-level assembly and is ready for reassembly. Replace all five connections for the front panel P510, P511, P508, P509, P1, and P4.
13. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:

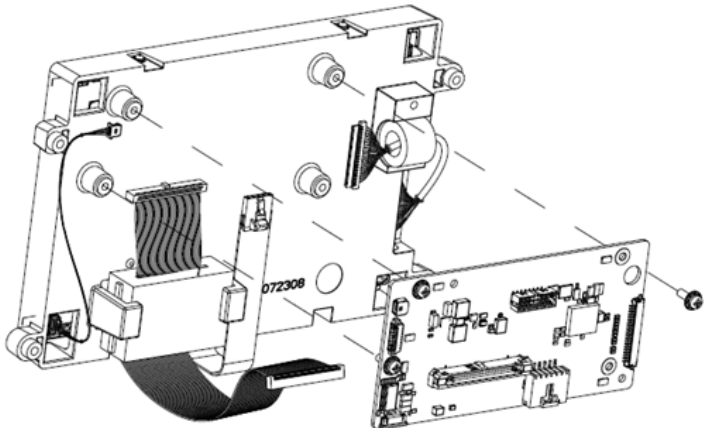


Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

14. Tighten bolts to 15 in./lb. of force.
15. Upon completion of the component replacement, follow the Touchscreen Calibration procedure outlined in this manual. See *Touchscreen Calibration* on page 7-2.
16. Set up the generator and log into Valleylab Exchange as you would when updating software. See *Software Updates* on page 10-5.

    Note: The system will issue an E233 error upon startup of the generator.
17. Valleylab Exchange automatically configures and registers the component.
18. After successful completion of the component setup and registration, the generator will automatically restart.
19. Follow the Periodic Safety Check (Routine Maintenance) procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.



E-PAC Foam Replacement

Equipment needed

- Torx T-10 driver
- Torx T-30 driver

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

For replacement of the E-PAC foam, various levels of E-PAC can be replaced. Each section of this replacement procedure is divided into 4 levels of E-PAC. Each level can be replaced individually or can encompass all levels of E-PAC foam depending on replacement needs.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Remove the top level of E-PAC foam exposing the RF PCBA. Set the foam aside for reinstallation.

   For 1st level E-PAC replacement only, acquire the replacement E-PAC foam and move to step 19.

4. Remove the red/black power cable located near the power supply from the RF PCBA. Remove the 5 flex cable connectors from the side of the RF PCBA furthest from the power supply.
5. Leaving the RF PCBA and RF fan in the second level of E-PAC foam, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.

   For 2nd level E-PAC replacement only, acquire the replacement E-PAC foam and move to step 18.

6. Locate the power-supply fan directly behind the power supply. Remove the wire harness from the P8 connector on the Controller PCBA. Locate the Ladder flex cable connector opposite the power supply and remove the connector from J7 on the Steering PCBA.
7. Locate the 5 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, and P1 on the Steering Relay PCBA. Remove the front-panel assembly and set aside for reinstallation.
8. Leaving the power-supply fan and Steering Relay PCBA in the third layer of E-PAC, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.

   For 3rd level E-PAC replacement only, acquire the replacement E-PAC foam and move to step 17.
9. Locate and remove the four wire harnesses from P9, P7, J9, and P4 from the Controller PCBA near to the power supply. Locate and remove the fan connector from the side of the Controller PCBA furthest from the power supply on connector P1.
10. Locate and remove the Ladder flex cable from the J2 connector on the side of the Controller PCBA furthest from the power supply. Set aside for reinstallation.
11. Using a T-10, remove the fastener holding the braided ground wire to the Controller PCBA. Set aside for reinstallation.

Notice

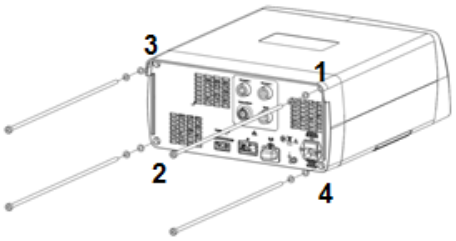
Before removing the Controller PCBA, ensure that the braided ground wire is removed from the Controller PCBA. Failure to remove the braided cable can lead to irreparable damage to the PCBA, ground connection, and/or the power supply.

12. Leaving the controller fan and Controller PCBA in the third layer of E-PAC, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.

    For complete E-PAC replacement, acquire the replacement E-PAC foam and move to step 13.
13. Replace the 4th layer of E-PAC foam into the chassis base ensuring that the foam cutout for the fan is facing the rear of the device.
14. Orient and place the Controller PCBA into the base piece of E-PAC foam along with the controller fan.
15. Using a T-10, replace the braided ground wire and screw. Torque the screw to 5.0 in./lb. of force.
16. Reconnect the Ladder cable to J2 as well as the P9, P7, J9, and P4 wire harnesses to their respective connection points. Reconnect the Controller PCBA fan to P1 as well.
17. Remove the Steering Relay PCBA and power-supply fan from the E-PAC foam and place the Steering Relay PCBA and power-supply fan into the replacement piece of E-PAC foam. Place the 3rd layer of E-PAC foam with the Steering Relay PCBA and power-supply fan onto the Controller PCBA ensuring that the Controller PCBA fan slides into the E-PAC foam cutout on the 3rd level of foam. Reconnect the Ladder flex cable to J7

on the Steering PCBA, the power-supply fan to J8, and all five connections for the front panel P510, P511, P508, P509, and P1 on the Steering Relay PCBA.

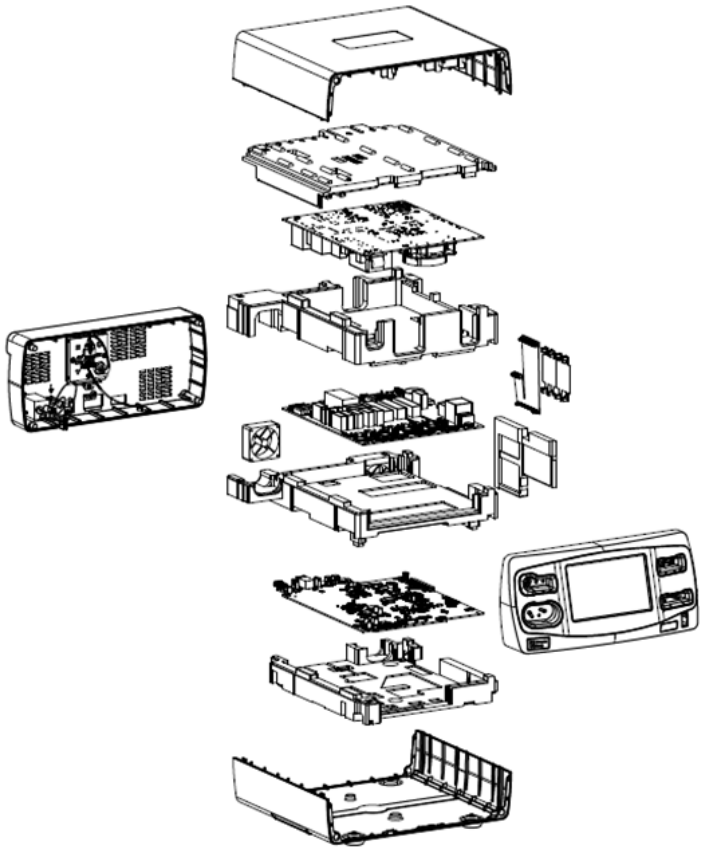
18. Remove the RF PCBA and RF fan from the E-PAC foam and place the RF PCBA and RF fan into the replacement piece of E-PAC foam. Place the 2nd layer of E-PAC foam with the RF PCBA and RF fan onto the Steering Relay PCBA foam ensuring that the power-supply fan slides into the E-PAC foam cutout on the 2nd level of foam. Reconnect the red/black power connector, 5 flex cable connectors, and RF fan connector.
19. Replace the top level of E-PAC foam with the new E-PAC foam and orient it onto the RF PCBA ensuring that the slots in the top level of foam align with the foam nubs from the 2nd layer of E-PAC foam.
20. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

21. Tighten the bolts to 15 in./lb. of force.
22. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.



Power-Supply Fan Replacement

Equipment needed

- Torx T-30 driver

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Remove the top level of E-PAC foam exposing the RF PCBA. Set the foam aside for reinstallation.
4. Remove the red/black power cable located near the power supply from the RF PCBA. Remove the 5 flex cable connectors from the side of the RF PCBA furthest from the power supply.
5. Leaving the RF PCBA and RF fan in the second level of E-PAC foam, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.
6. Locate the power-supply fan directly behind the power supply. Remove the wire harness from the P8 connector on the Controller PCBA.
7. Lift and remove the fan from the E-PAC.

Warning

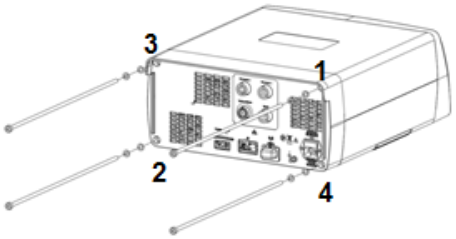
Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

8. Locate and remove the replacement fan from the packaging. Orient the fan so that the power cable so that it is facing down and the fan is blowing out or towards the rear of the device.
9. Reconnect the power cable to P6 on the Display PCBA.
10. Replace the 2nd layer of E-PAC foam with the RF PCBA and RF fan onto the Steering Relay PCBA foam ensuring that the power-supply fan slides into the E-PAC foam cutout on the 2nd level of foam. Reconnect the red/black power connector, 5 flex cable connectors, and RF fan connector.
11. Replace the top level of E-PAC foam onto the RF PCBA ensuring that the slots in the top level of foam align with the foam nubs from the 2nd layer of E-PAC foam.

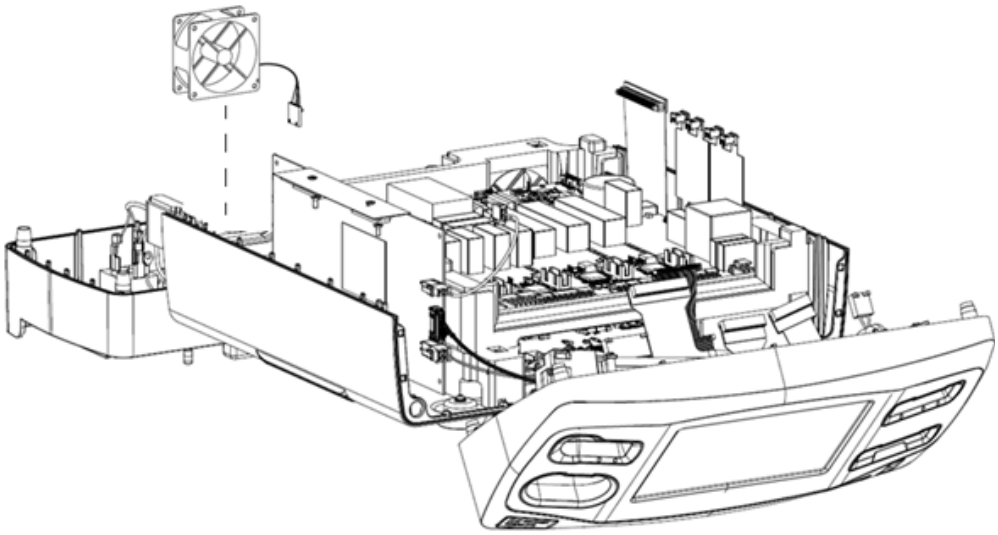
12. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

13. Tighten the bolts to 15 in./lb. of force.



14. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

Power-Supply Module Replacement

Equipment needed

- Torx T-30 driver
- Valleylab Exchange

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Remove the top level of E-PAC foam exposing the RF PCBA. Set the foam aside for reinstallation.
4. Locate and remove the blue/brown/green connector from the rear of the device connected to the J1 connector on the rear of the power supply. Set aside for reinstallation.

   Note: If the J1 connector cannot be reached, reference the Controller PCBA work instruction remove all of the PCBAs to gain access to the rear of the power supply. Use the same work instruction for reassembly instructions.
5. Locate and remove the three connectors on the front of the power supply at J2, J3, and J4. Set aside for reinstallation.
6. Grabbing the power supply with both hands by the metal enclosure of the power supply, pull vertically to remove the power supply.

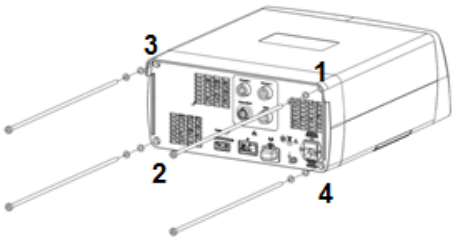
Warning

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

7. Locate and remove the replacement power from the protective ESD bag. Orient the power supply so that the tab on the metal enclosure faces away from the PCBA stack. The three connectors J2, J3, and J4 should be facing the front of the device. Slide the power supply down until the standoffs come through the tab on the power supply.
8. Reconnect the blue/brown/green connector to the rear of the power supply and the 3 cables to the J2, J3, and J4 connectors.
9. Replace the top level of E-PAC foam onto the RF PCBA ensuring that the slots in the top level of foam align with the foam nubs from the 2nd layer of E-PAC foam.
10. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



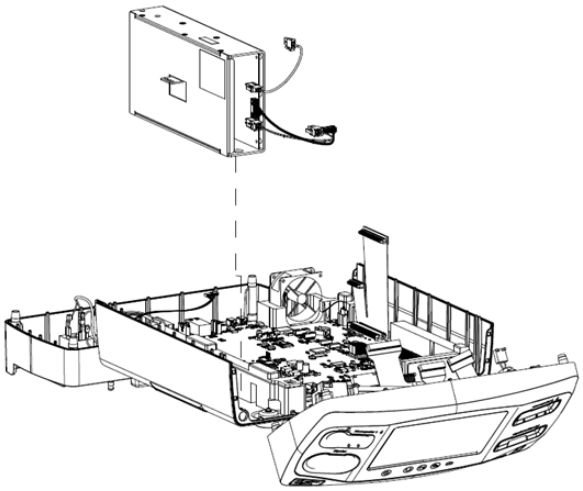
Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

11. Tighten the bolts to 15 in./lb. of force.
12. Set up the generator and log into Valleylab Exchange as you would when updating software. See *Software Updates* on page 10-5.

    Note: The system will issue an E233 error upon startup of the generator.
13. Valleylab Exchange automatically configures and registers the component.
14. After successful completion of the component setup and registration, the generator will automatically restart.

15. Follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.



Speaker Replacement

Equipment needed

- Torx T-10 driver
- Torx T-30 driver

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate the 6 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, P4, and P1. Remove the front-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
4. Using a T-10, remove the 2 screws holding the speaker bracket. Set them aside for reinstallation.
5. Remove the speaker and foam assembly.

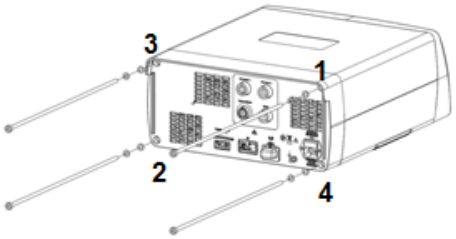
Warning

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

6. Locate and remove the replacement speaker and foam from the packaging. Orient the foam tab so that it slides into the front-panel assembly under the LCD module.
7. Reinstall the foam and speaker assembly.
8. Using a T-10, reinstall the bracket and fasteners and torque them to 5.0 in/lb.
9. Orient the front-panel assembly so that it aligns with the top-level assembly and is ready for reassembly. Replace all six connections for the front panel P510, P511, P508, P509, P4, and P1.
10. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:

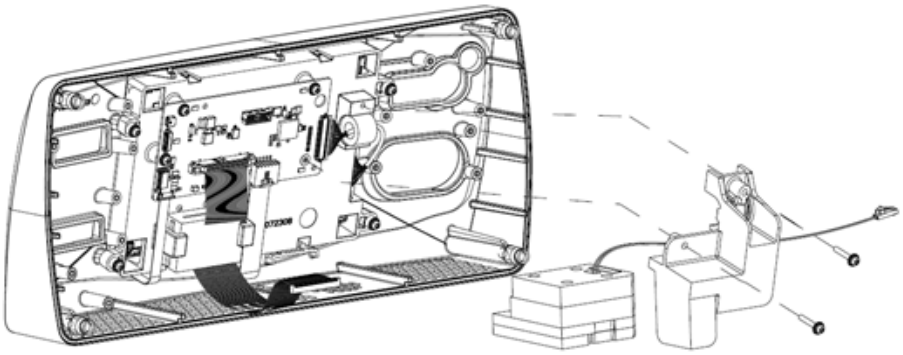


Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left

- Bottom right

11. Tighten the bolts to 15 in./lb. of force.



12. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

RF Fan Replacement

Equipment needed

- Torx T-30 driver

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Remove the top level of E-PAC foam exposing the RF PCBA. Set the foam aside for reinstallation.
4. Remove the fan power cable from P6.
5. Lift and remove the fan from the E-PAC.

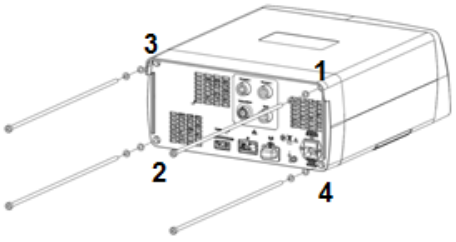
Warning

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

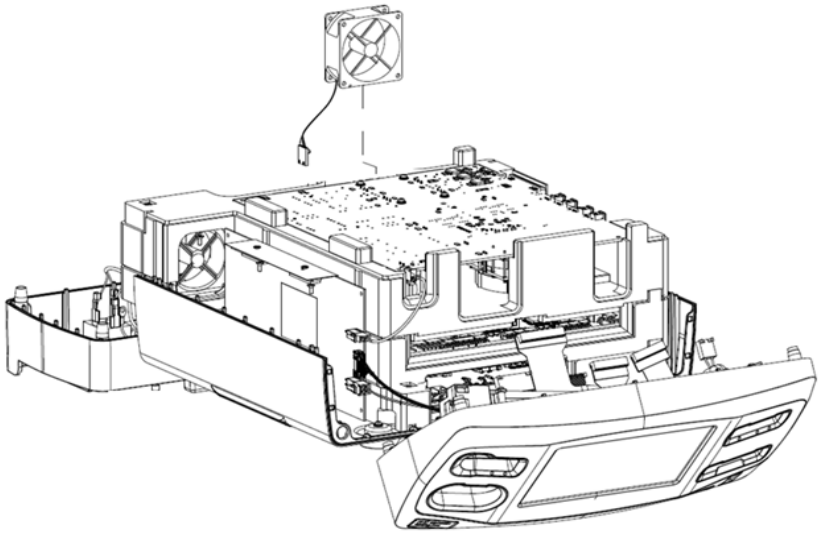
6. Locate and remove the replacement fan from the packaging. Orient the fan so that the power cable so that it is facing down and the fan is blowing out or towards the rear of the device.
7. Reconnect the power cable to P6.
8. Replace the top level of E-PAC foam onto the RF PCBA ensuring that the slots in the top level of foam align with the foam nubs from the 2nd layer of E-PAC foam.
9. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

10. Tighten the bolts to 15 in./lb. of force.



11. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

RF PCBA Replacement

Equipment needed

- Torx T-30 driver
- Valleylab Exchange

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.

2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Remove the top level of E-PAC foam exposing the RF PCBA. Set the foam aside for reinstallation.
4. Remove the red/black power cable located near the power supply from the RF PCBA. Remove the 5 flex cable connectors from the side of the RF PCBA furthest from the power supply.
5. Remove the RF PCBA by holding the edges of the PCBA from the E-PAC foam.

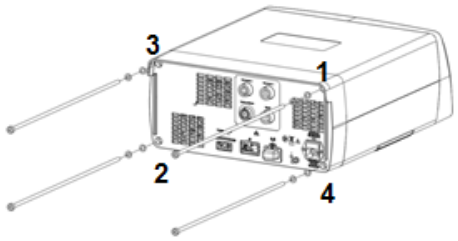
Warning

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

6. Locate and remove the replacement PCBA from the protective ESD bag handling the PCBA only by the edges of the board. Orient the RF PCBA so that the PCBA is facing down and that the 5 flex cable connection points are facing furthest away from the power supply.
7. Reconnect the red/black power connector and 5 flex cable connectors.
8. Replace the top level of E-PAC foam onto the RF PCBA ensuring that the slots in the top level of foam align with the foam nubs from the 2nd layer of E-PAC foam.
9. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

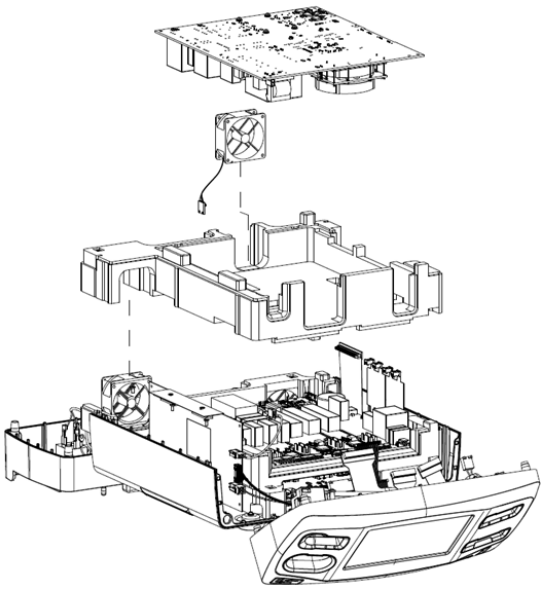
- Top right
- Bottom left

- Top left
- Bottom right

10. Tighten the bolts to 15 in./lb. of force.
11. Set up the generator and log into Valleylab Exchange as you would when updating software. See *Software Updates* on page 10-5.

    Note: The system will issue an E233 error upon startup of the generator.
12. Valleylab Exchange automatically configures and registers the component.
13. After successful completion of the component setup and registration, the generator will automatically restart.

    Note: The system may issue an E239 error upon startup of the generator.
14. Follow the Energy Calibration procedure outlined in this manual. See *Energy Calibration* on page 7-4.
15. Follow the Periodic Safety Check (Routine Maintenance) procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.



Steering Relay PCBA Replacement

Equipment needed

- Torx T-30 driver
- Valleylab Exchange

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Remove the top level of E-PAC foam exposing the RF PCBA. Set the foam aside for reinstallation.
4. Remove the red/black power cable located near the power supply from the RF PCBA. Remove the 5 flex cable connectors from the side of the RF PCBA furthest from the power supply.
5. Leaving the RF PCBA and RF fan in the second level of E-PAC foam, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.
6. Locate the power-supply fan directly behind the power supply. Remove the wire harness from the P8 connector on the Controller PCBA. Locate the Ladder flex cable connector opposite the power supply and remove the connector from J7 on the Steering PCBA.
7. Locate the 5 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, and P1 on the Steering Relay PCBA. Remove the front-panel assembly and set aside for reinstallation.
8. Locate and remove the two flex cables from the side of the Steering Relay PCBA furthest from the power supply P505, P507, P504, and P506. Set both aside for reinstallation.
9. Remove the Steering Relay PCBA by holding the edges of the PCBA from the E-PAC foam.

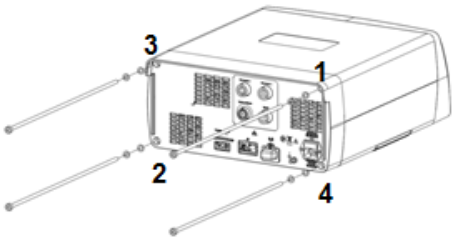
Warning

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

10. Locate and remove the replacement PCBA from the protective ESD bag handling the PCBA only by the edges of the board. Orient the Steering Relay PCBA so that the PCBA will slide down into the E-PAC foam ensuring the five front panel connection points face the front of the device.
11. Reconnect the Ladder flex cable to J7 on the Steering PCBA, the power-supply fan to J8, and all five connections for the front panel P510, P511, P508, P509, and P1 on the Steering Relay PCBA.
12. Replace the 2nd layer of E-PAC foam with the RF PCBA and RF fan onto the Steering Relay PCBA foam ensuring that the power-supply fan slides into the E-PAC foam cutout on the 2nd level of foam. Reconnect the red/black power connector, 5 flex cable connectors, and RF fan connector.
13. Replace the top level of E-PAC foam onto the RF PCBA ensuring that the slots in the top level of foam align with the foam nubs from the 2nd layer of E-PAC foam.
14. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



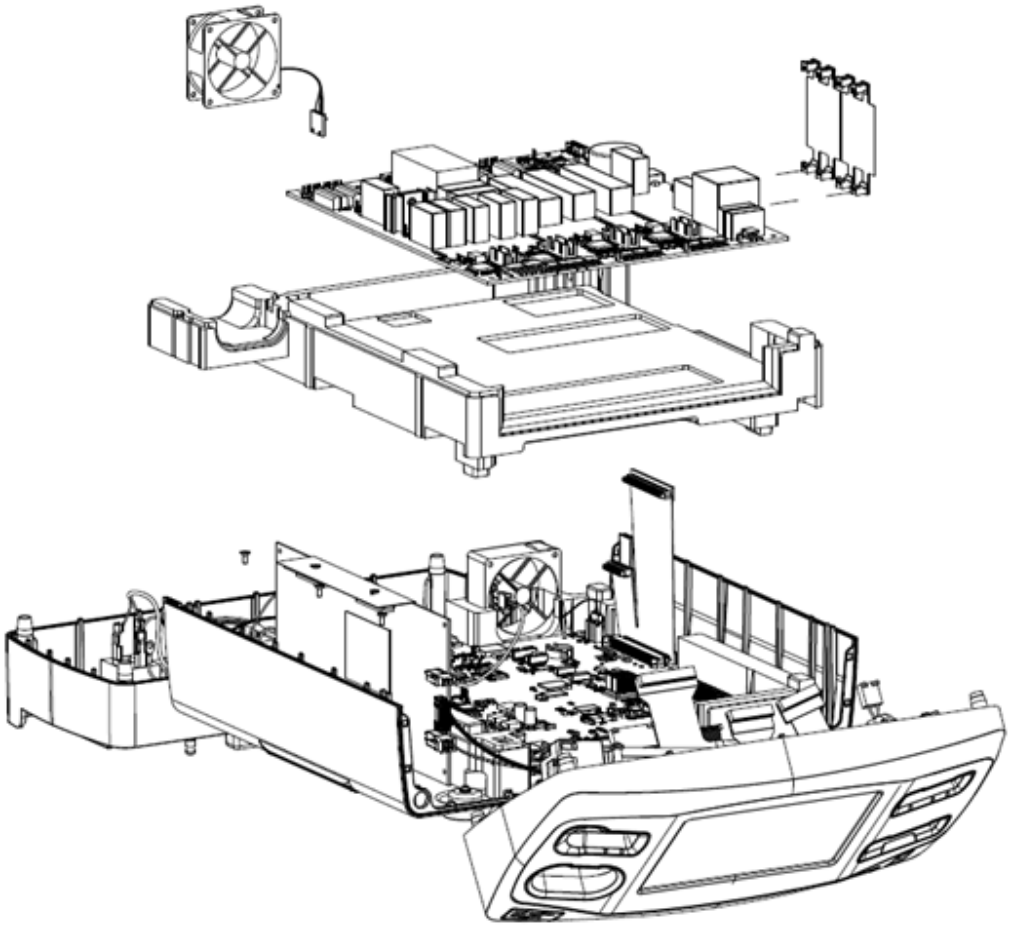
Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

15. Tighten the bolts to 15 in./lb. of force.
16. Set up the generator and log into Valleylab Exchange as you would when updating software. See *Software Updates* on page 10-5.

Note: The system may issue an E219 error upon startup of the generator. If so, continue to reboot the generator until an E233 error appears.

17. Valleylab Exchange automatically configures and registers the component.
18. After successful completion of the component setup and registration, the generator will automatically restart.
19. Follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.



Top Cover Replacement

Equipment needed

- Torx T-30 driver

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least 5 minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

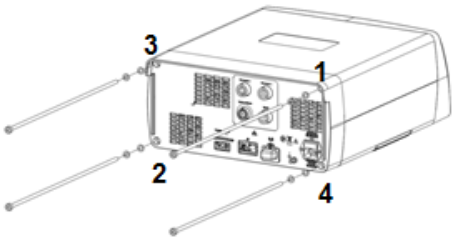
Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate and remove the replacement top cover from its packaging. Orient the cover to where the labeling is facing forward and is readable.
4. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

5. Tighten the bolts to 15 in./lb. of force.

6. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

Front-Panel Assemblies

Front Bezel Replacement

Equipment needed

- Torx T-10 driver
- Torx T-30 driver

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

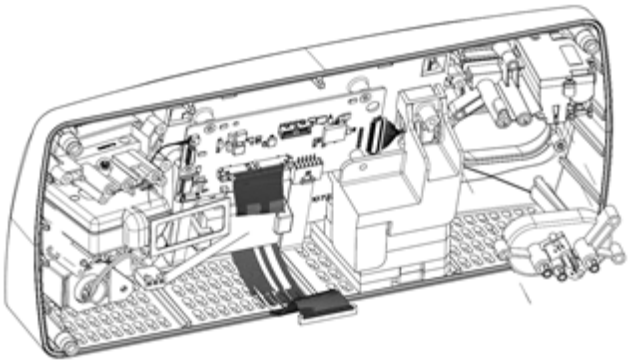
Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

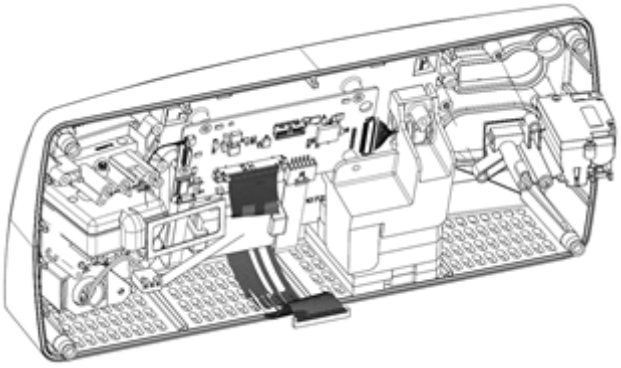
Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

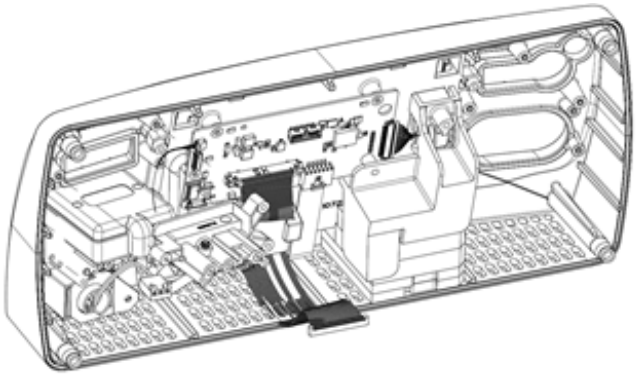
3. Locate the 6 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, P4, and P1. Remove the front-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
4. Using a T-10, locate and remove the three screws holding the Bipolar receptacle to the front-panel assembly. Set aside for reinstallation.



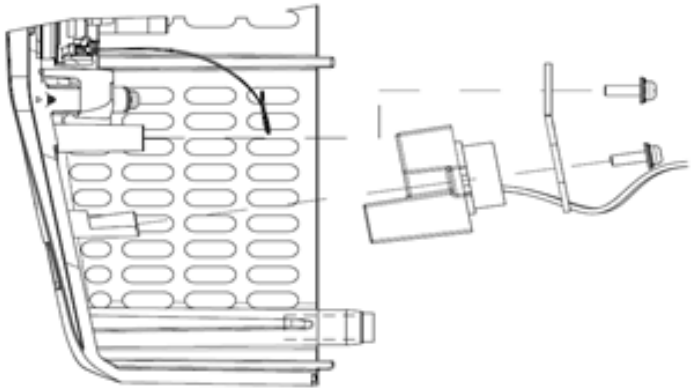
5. Using a T-10, locate and remove the three screws holding the Monopolar 2 receptacle to the front panel assembly. Set aside for reinstallation.



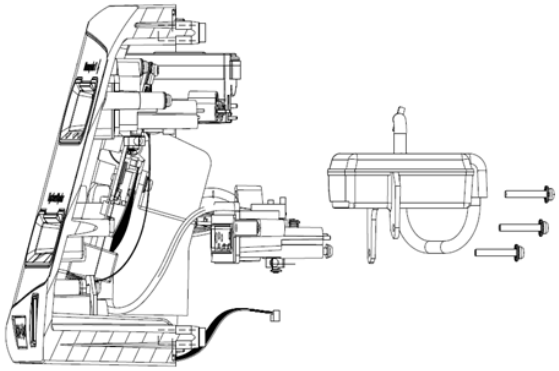
6. Using a T-10, locate and remove the three screws holding the Monopolar 1 receptacle to the front-panel assembly. Set aside for reinstallation.



7. Using a T-10, locate and remove the two screws holding the REM assembly to the front-panel assembly. Set aside for reinstallation.

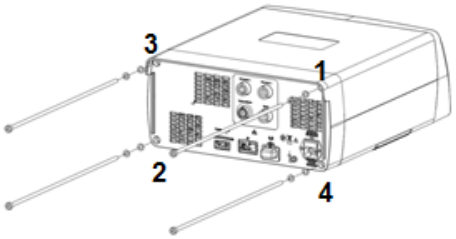


8. Using a T-10, locate and remove the three screws holding the LigaSure/Bipolar receptacle and VIBE to the front-panel assembly.



9. Locate and remove the P1 and J2 connector from the display PCBA.(Stopped here 10/8)
10. Insert all three screws into the replacement Monopolar 3 receptacle.
11. Place the receptacle into the front-panel assembly taking care not to damage the surrounding cables during installation.
12. Torque the three screws to 5 in/lb.
13. Orient the front-panel assembly so that it aligns with the top-level assembly and is ready for reassembly. Replace all six connections for the front panel P510, P511, P508, P509, P4, and P1.

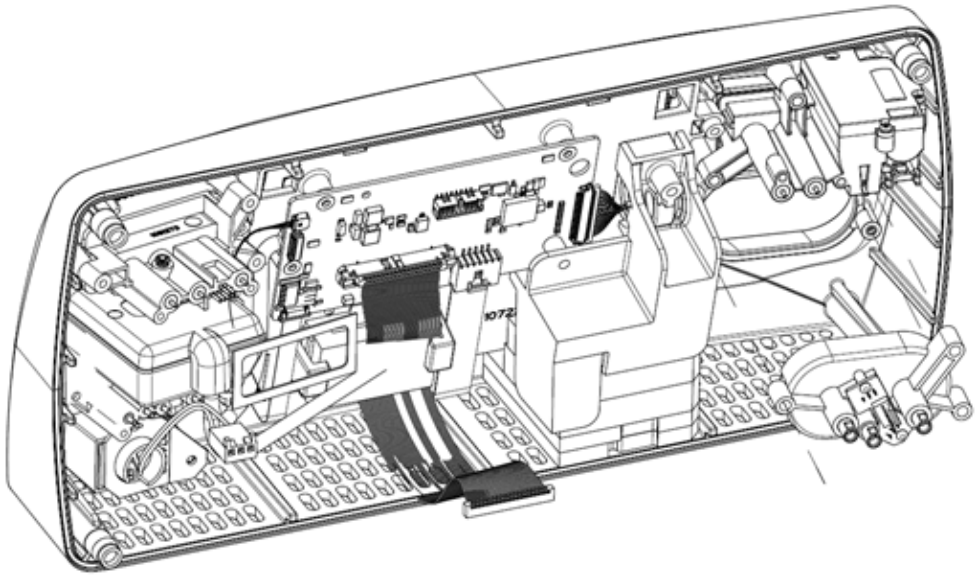
14. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

15. Tighten the bolts to 15 in./lb. of force.



16. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

Bipolar Receptacle Replacement

Equipment needed

- Torx T-10 driver
- Torx T-30 driver

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

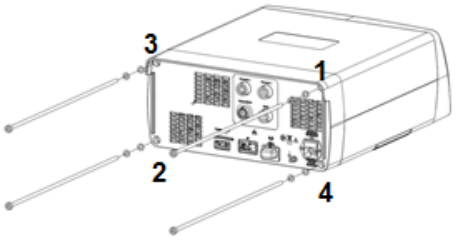
1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate the 6 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, P4, and P1. Remove the front-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
4. Using a T-10, locate and remove the three screws holding the Bipolar receptacle to the front-panel assembly. Set aside for reinstallation.
5. Remove the Bipolar receptacle from the front-panel assembly taking care not to damage the surrounding cables during removal.
6. Locate and remove the replacement Bipolar receptacle from the packaging.
7. Insert all three screws into the replacement Monopolar 3 receptacle.
8. Place the receptacle into the front-panel assembly taking care not to damage the surrounding cables during installation.
9. Torque the three screws to 5 in/lb.

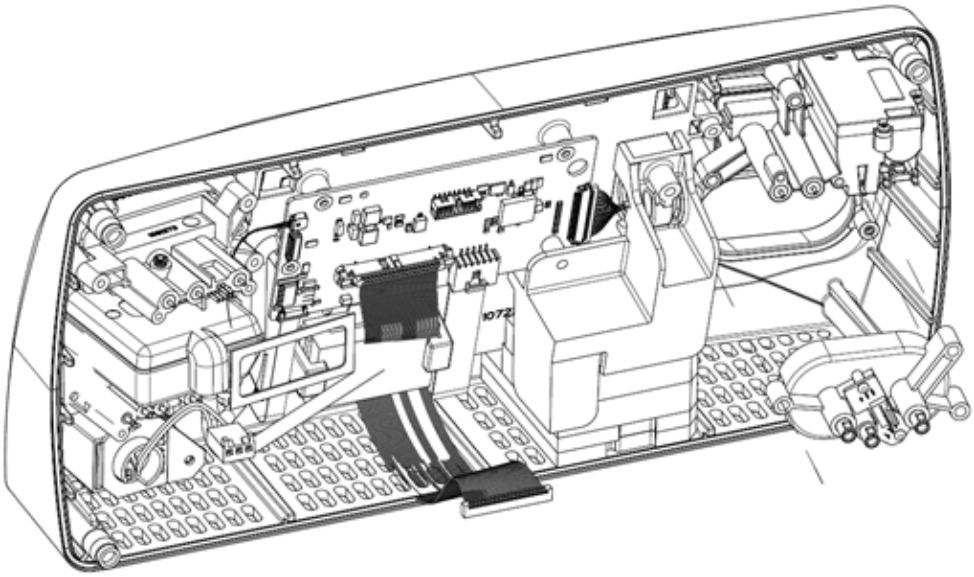
10. Orient the front-panel assembly so that it aligns with the top-level assembly and is ready for reassembly. Replace all six connections for the front panel P510, P511, P508, P509, P4, and P1.
11. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

12. Tighten the bolts to 15 in./lb. of force.



13. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

LigaSure/Bipolar Receptacle Replacement

Equipment needed

- Torx T-10 driver
- Torx T-30 driver

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

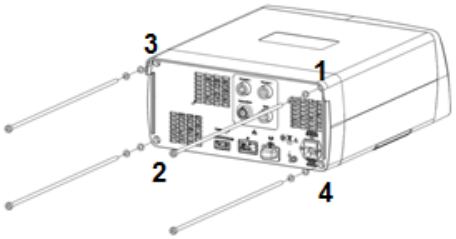
1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate the 6 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, P4, and P1. Remove the front-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
4. Using a T-10, locate and remove the three screws holding the LigaSure/Bipolar receptacle to the front-panel assembly. Set aside for reinstallation.
5. Locate and remove the VIBE assembly from the top of the LigaSure/Bipolar receptacle. Set aside for reinstallation.
6. Remove the LigaSure/Bipolar receptacle from the front-panel assembly taking care not to damage the Monopolar-receptacle ribbon cable during removal.
7. Locate and remove the replacement LigaSure/Bipolar receptacle from the packaging.
8. Assemble the VIBE assembly onto the replacement LigaSure/Bipolar receptacle and insert all three screws into the assembly.
9. Place the VIBE and receptacle assembly into the front-panel assembly taking care not to damage the Monopolar-connecter ribbon cable during installation.

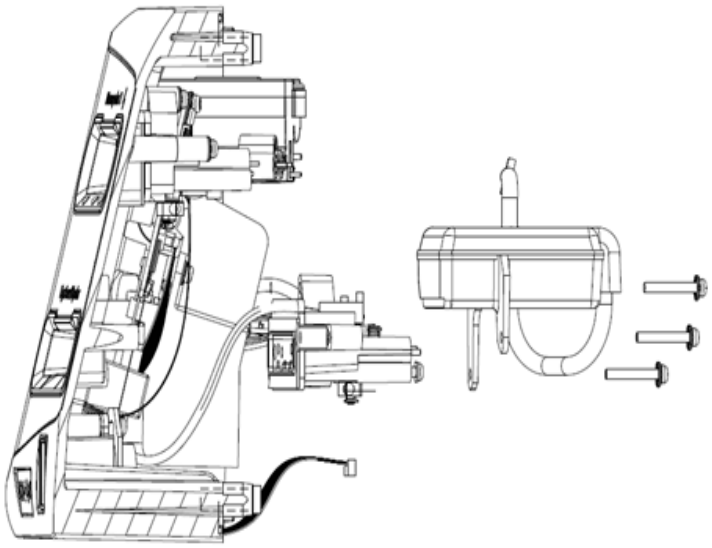
10. Torque the three screws to 5 in/lb.
11. Orient the front-panel assembly so that it aligns with the top-level assembly and is ready for reassembly. Replace all six connections for the front panel P510, P511, P508, P509, P4, and P1.
12. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

13. Tighten the bolts to 15 in./lb. of force.
14. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.



Monopolar 1 Receptacle Replacement

Equipment needed

- Torx T-10 driver
- Torx T-30 driver

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

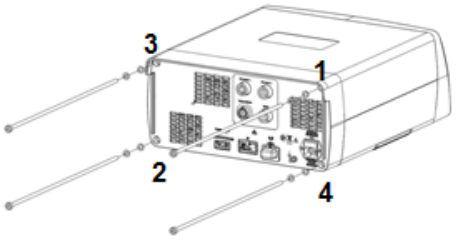
1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate the 6 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, P4, and P1. Remove the front-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
4. Using a T-10, locate and remove the three screws holding the Monopolar 1 receptacle to the front-panel assembly. Set aside for reinstallation.
5. Remove the Monopolar 1 receptacle from the front-panel assembly taking care not to damage the surrounding cables during removal.
6. Locate and remove the replacement Monopolar 1 receptacle from the packaging.
7. Insert all three screws into the replacement Monopolar 1 receptacle.
8. Place the receptacle into the front-panel assembly taking care not to damage the surrounding cables during installation.
9. Torque the three screws to 5 in/lb.

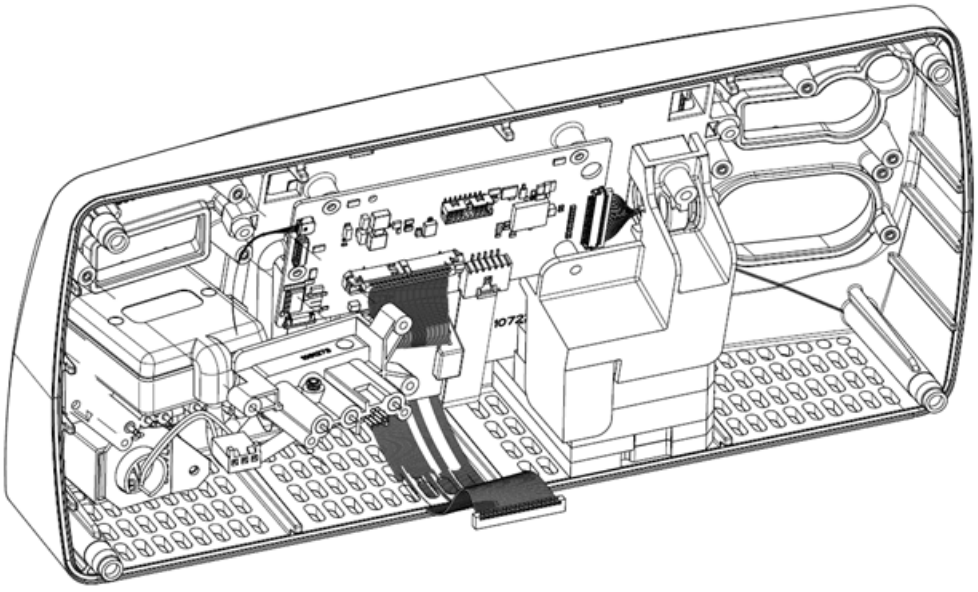
10. Orient the front-panel assembly so that it aligns with the top-level assembly and is ready for reassembly. Replace all six connections for the front panel P510, P511, P508, P509, P4, and P1.
11. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

12. Tighten the bolts to 15 in./lb. of force.



13. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

Monopolar 2 Receptacle Replacement

Equipment needed

- Torx T-10 driver
- Torx T-30 driver

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

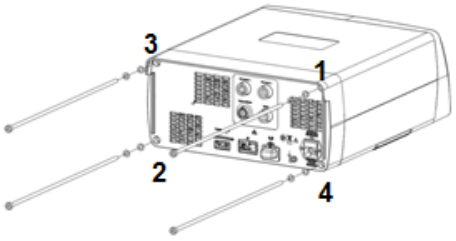
1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate the 6 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, P4, and P1. Remove the front-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
4. Using a T-10, locate and remove the three screws holding the Monopolar 2 receptacle to the front-panel assembly. Set aside for reinstallation.
5. Remove the Monopolar 2 receptacle from the front-panel assembly taking care not to damage the surrounding cables during removal.
6. Locate and remove the replacement Monopolar 2 receptacle from the packaging.
7. Insert all three screws into the replacement Monopolar 3 receptacle.
8. Place the receptacle into the front-panel assembly taking care not to damage the surrounding cables during installation.
9. Torque the three screws to 5 in/lb.

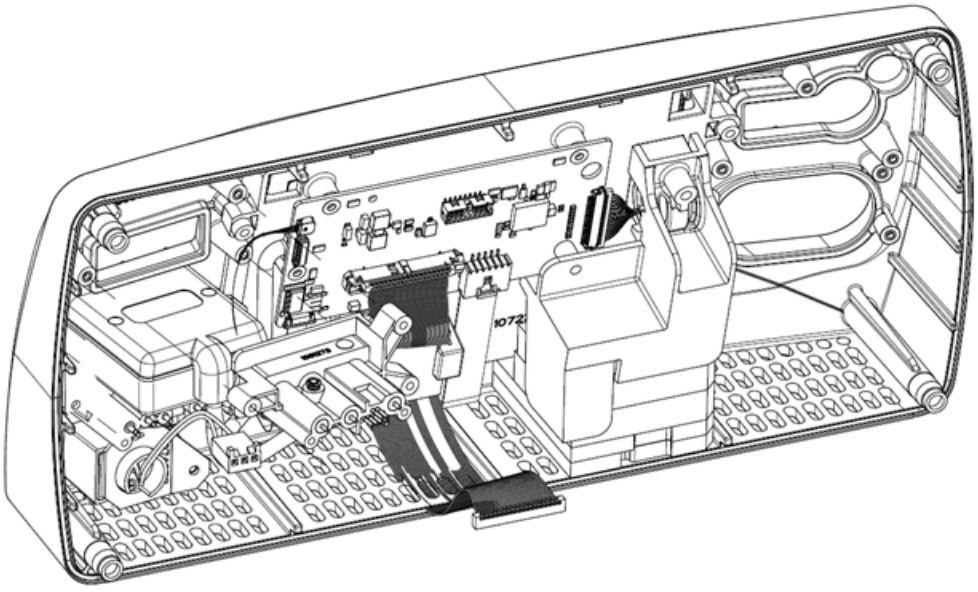
10. Orient the front-panel assembly so that it aligns with the top-level assembly and is ready for reassembly. Replace all six connections for the front panel P510, P511, P508, P509, P4, and P1.
11. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

12. Tighten the bolts to 15 in./lb. of force.



13. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

VIBE Replacement

Equipment needed

- Torx T-10 driver
- Torx T-30 driver
- Valleylab Exchange

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate the 6 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, P4, and P1. Remove the front-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
4. Locate the three screws holding the LigaSure/Bipolar receptacle and VIBE to the front-panel assembly and remove with a T-10 driver.
5. Locate and remove the VIBE assembly from the top of the LigaSure/Bipolar receptacle. Set aside the receptacle and screws for reinstallation.

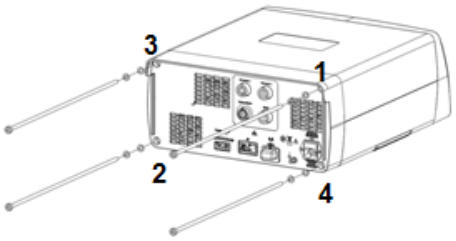
Warning

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

6. Locate and remove the replacement VIBE from the ESD packaging.
7. Assemble the VIBE assembly onto the replacement LigaSure/Bipolar receptacle and insert all three screws into the assembly.
8. Place the VIBE and receptacle assembly into the front-panel assembly taking care not to damage the monopolar connecter flex cable during installation.
9. Torque the three screws to 5 in/lb.
10. Orient the front-panel assembly so that it aligns with the top-level assembly and is ready for reassembly. Replace all six connections for the front panel P510, P511, P508, P509, P4, and P1.
11. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



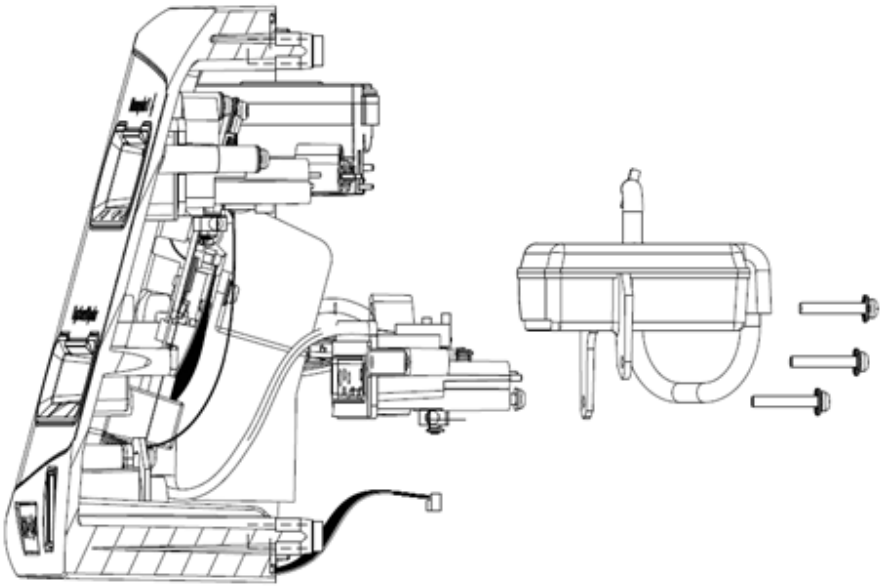
Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

12. Tighten the bolts to 15 in./lb. of force.
13. Set up the generator and log into Valleylab Exchange as you would when updating software. See *Software Updates* on page 10-5.

    Note: The system will issue an E233 error upon startup of the generator.
14. Valleylab Exchange automatically configures and registers the component.

15. After successful completion of the component setup and registration, the generator will automatically restart.
16. Register the component using Valleylab Exchange. See *Software Updates* on page 10-5.



17. Follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

REM Assembly Replacement

Equipment needed

- Torx T-10 driver
- Torx T-30 driver

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

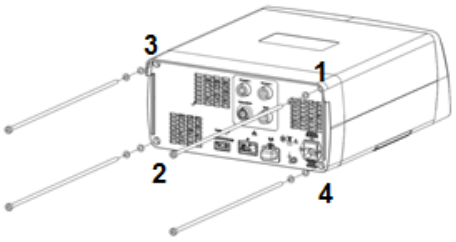
1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate the 6 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, P4, and P1. Remove the front-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
4. Locate the two screws holding the REM assembly to the front-panel assembly and remove with a T-10 driver. Set aside for reinstallation.
5. Remove the metal bracketing from the bad REM assembly. Set aside for reinstallation.
6. Remove the REM assembly from the front-panel assembly taking care not to damage the LigaSure/Bipolar connecter flex cable during removal.
7. Locate and remove the replacement REM assembly from the packaging.
8. Locate the metal bracketing and orient the bracket so that the bend tab is facing upwards.
9. Place the REM assembly into the front-panel assembly taking care not to damage the LigaSure/Bipolar connecter flex cable during installation.

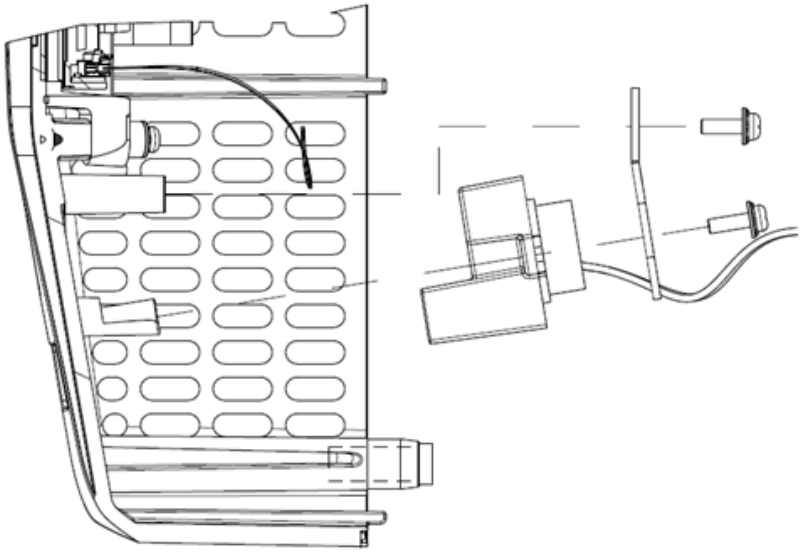
   Note: Flip the front-panel assembly over to see the front of the panel. Ensure that the REM assembly is within the housing and flush with the front panel.
10. Orient the metal bracket so that both holes align to the mounts. Insert the screws and torque them to 5 in/lb.
11. Orient the front-panel assembly so that it aligns with the top-level assembly and is ready for reassembly. Replace all six connections for the front panel P510, P511, P508, P509, P4, and P1.
12. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

13. Tighten the bolts to 15 in./lb. of force.
14. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.



LCD Module Replacement

Equipment needed

- Torx T-30 driver
- #1 Phillips screwdriver

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate the 6 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, P4, and P1. Remove the front-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
4. Locate and remove the P1 and J2 connector from the display PCBA.
5. Using a T-10, remove the 2 screws holding the speaker bracket. Set them aside for reinstallation.
6. Using a T-10, remove the 3 screws holding the display PCBA to the LCD mount. Set them aside for reinstallation.
7. Remove the fan and foam assembly. Set aside for reinstallation.

Warning

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

8. Carefully remove the LCD assembly from the front panel ensuring that no damage occurs to the flex cables within the assembly.
9. Locate and remove the touchscreen connector from the P5 connection point on the display PCBA.
10. Remove the touchscreen assembly from the LCD assembly. Set aside for reinstallation.
11. Remove the backlight cable (4-wire, black) from the rear of the LCD module. Set aside for reinstallation.
12. Remove the LCD display cable (20-wire, multi-color) from the rear of the LCD module. Set aside for reinstallation.
13. Using the #1 Phillips screw driver, remove the bottom 2 screws holding the LCD module into the metal housing. **Do not** remove all four screws. Set screws aside for reinstallation.

Warning

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

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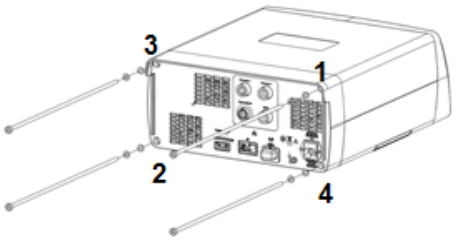
14. Locate and remove the replacement LCD module from the protective ESD bag. Orient the LCD module so that the backlight and LCD display cable connection points can be seen through the LCD module metal housing.
15. Using the #1 Phillips screw driver, reinstall the two LCD module mounting screws. Torque to 1.7 in/lb.
16. Reinstall both the backlight and LCD display cables into the replacement LCD module.
17. On the touchscreen, locate the smooth, glass side and the bumpy, touchscreen side. Orient the touchscreen so that the smooth, glass side is towards the LCD module and the bumpy, touchscreen side is facing away from the LCD module.
18. Reinstall the touchscreen connector on the P5 connection point on the display PCBA.

19. Holding the touchscreen against the LCD module, carefully insert the left side of the LCD assembly into the mounting points nearest to the Monopolar 2 and LigaSure/ Bipolar receptacles ensuring that no damage occurs to the flex cables within the assembly.
20. Supporting the touchscreen and LCD module from the front side of the front-panel assembly, gently lower the right side of the LCD assembly onto the mounting points nearest to the Monopolar 1 and bipolar receptacles.

    Note: Properly inspecting the touchscreen alignment in the next step is CRITICAL to the installation. Failure to properly inspect and then secure the fasteners can lead to broken touchscreens. Breaking touchscreens during the installation process may not be covered by the product warranty.
21. Holding the LCD module into the front-panel assembly, rotate the front-panel assembly to inspect the LCD/touchscreen alignment in the front-panel assembly. The LCD/touchscreen assembly should be:
    - Flush with the front panel
    - Center aligned with no visual offsets vertically or horizontally
    - Parallel with the front-panel assembly cutout without rotational offset
22. Reinstall the 3 screws into the LCD mounts and secure them to 5 in/lb.
23. Reinstall the 2 screws and fan bracket and secure them to 5 in/lb.

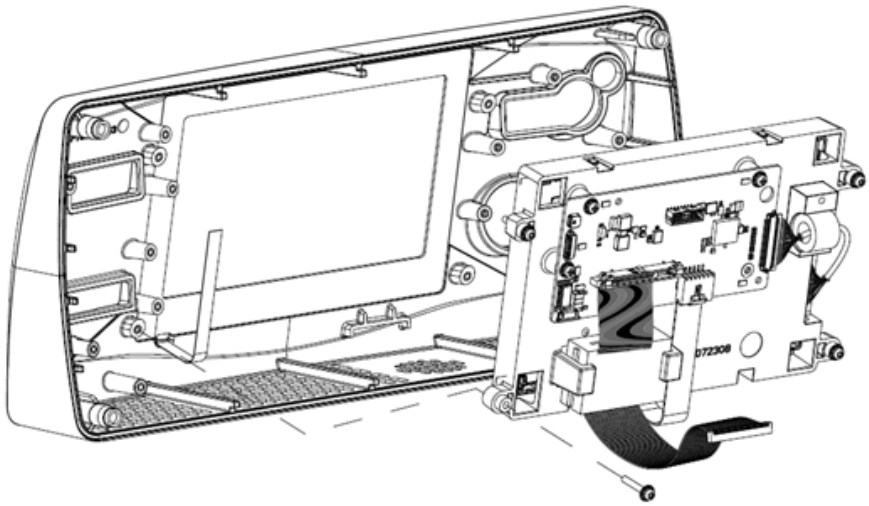
    Note: Over torquing the screws holding the LCD assembly to the front panel may result in cracking of the touchscreen assembly. Breaking touchscreens during the installation process may not be covered by the product warranty.
24. Reconnect P1 on the display PCBA.
25. After ensuring that the locking feature is pulled out of J2, insert the flex cable into J2. Complete the connection by sliding the locking feature towards the PCBA.
26. Reinstall the foam and speaker assembly.
27. Reinstall the 2 screws holding the speaker into place and torque to 5.0 in/lb.
28. Orient the front-panel assembly so that it aligns with the top-level assembly and is ready for reassembly. Replace all six connections for the front panel P510, P511, P508, P509, P4, and P1.
29. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

30. Tighten the bolts to 15 in./lb. of force.



31. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

Touchscreen Assembly Replacement

Equipment needed

- Torx T-10 driver
- Torx T-30 driver
- M2 hex

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate the 6 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, P4, and P1. Remove the front-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
4. Locate and remove the P1 and J2 connector from the display PCBA.
5. Using a T-10, remove the 2 screws holding the speaker bracket. Set them aside for reinstallation.
6. Using a T-10, remove the 3 screws holding the display PCBA to the LCD mount. Set them aside for reinstallation.
7. Carefully remove the LCD assembly from the front panel ensuring that no damage occurs to the flex cables within the assembly.
8. Locate and remove the touchscreen connector from the P5 connection point on the display PCBA.
9. Remove the touchscreen assemble from the LCD assembly.

Warning

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

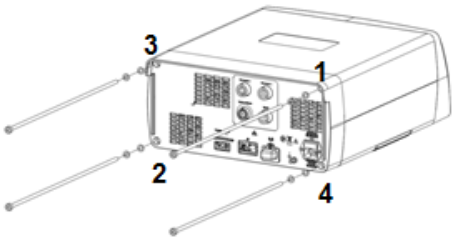
Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

10. Locate and remove the touchscreen from the protective ESD bag. On the touchscreen, locate the smooth, glass side and the bumpy, touchscreen side. Orient the touchscreen so that the smooth, glass side is towards the LCD module and the bumpy, touchscreen side is facing away from the LCD module.
11. Reinstall the touchscreen connector on the P5 connection point on the display PCBA.
12. Holding the touchscreen against the LCD module, carefully insert the left side of the LCD assembly into the mounting points nearest to the Monopolar 2 and LigaSure/ Bipolar receptacles ensuring that no damage occurs to the flex cables within the assembly.
13. Supporting the touchscreen and LCD module from the front side of the front-panel assembly, gently lower the right side of the LCD assembly onto the mounting points nearest to the Monopolar 1 and bipolar receptacles.

    Note: Properly inspecting the touchscreen alignment in the next step is CRITICAL to the installation. Failure to properly inspect and then secure the fasteners can lead to broken touchscreens. Breaking touchscreens during the installation process may not be covered by the product warranty.
14. Holding the LCD module into the front-panel assembly, rotate the front-panel assembly to inspect the LCD/touchscreen alignment in the front-panel assembly. The LCD/touchscreen assembly should be:
    - Flush with the front panel
    - Center aligned with no visual offsets vertically or horizontally
    - Parallel with the front-panel assembly cutout without rotational offset
15. Reinstall the 2 screws into the LCD mounts and secure them to 5 in/lb.

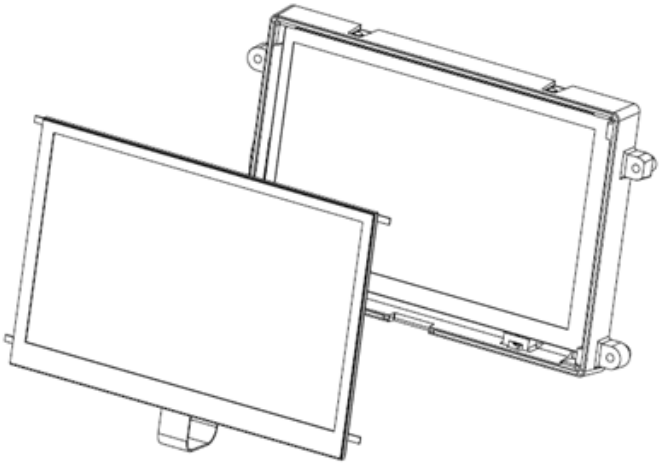
    Note: Over torquing the screws holding the LCD assembly to the front panel may result in cracking of the touchscreen assembly. Breaking touchscreens during the installation process may not be covered by the product warranty.
16. Reconnect P1 on the display PCBA.
17. After ensuring that the locking feature is pulled out of J2, insert the flex cable into J2. Complete the connection by sliding the locking feature towards the PCBA.
18. Orient the front-panel assembly so that it aligns with the top-level assembly and is ready for reassembly. Replace all six connections for the front panel P510, P511, P508, P509, P4, and P1.
19. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

20. Tighten the bolts to 15 in./lb. of force.
21. Upon completion of the component replacement, follow the touchscreen calibration procedure outlined in this manual. See *Touchscreen Calibration* on page 7-2.



Rear-Panel Assemblies

EMI Filter Replacement

Equipment needed

- Torx T-30 driver
- #1 Phillips Screwdriver

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate and remove the line (brown), neutral (blue), and ground (green/yellow) wires from the EMI filter.
4. Locate the two screws holding the EMI filter to the rear panel and remove with a #1 Phillips screwdriver. Set the fasteners aside for reinstallation.
5. Remove the EMI from the rear-panel assembly.

Warning

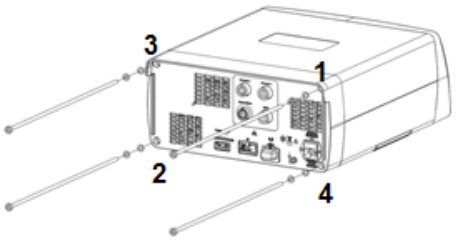
Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

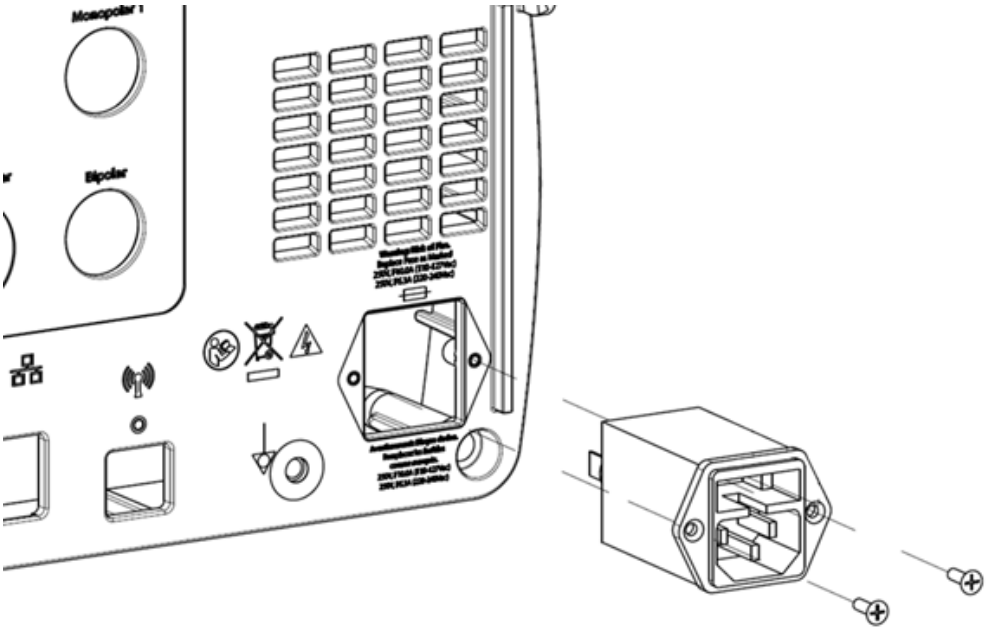
6. Locate and remove the replacement EMI filter from the packaging.
7. Place the EMI filter into the rear-panel assembly ensuring proper orientation with the fuse drawer on top as shown in the illustration.
8. Reinstall and torque the two screws to 5 in/lb.
9. Reinstall the line (brown), neutral (blue), and ground (green/yellow) wires the to the EMI filter.

   Note: Ensure proper electrical connections to the EMI filter. Incorrect connection may cause irreversible damage to the device.
10. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right



11. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

Equipotential Ground Connection Replacement

Equipment needed

- Torx T-30 driver
- 10 mm wrench

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

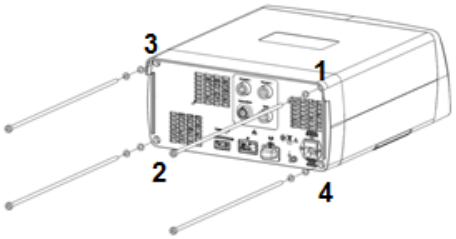
Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate the 3 ground wire harnesses connecting the rear panel to the top-level assembly and remove the 3 nuts holding the wire harnesses in place using a 10 mm wrench.
4. Using a 10 mm wrench, remove the ground connection from the rear of the rear panel.
5. Locate and remove the replacement equipotential ground connection from the packaging.
6. Thread the equipotential ground connection into the rear-panel assembly.
7. Torque the equipotential ground connection to 15 in/lb.
8. Using a 10 mm wrench, replace the ground wires to the equipotential ground connection on the rear panel. The order of placement is:
    1) Ground wire from the power supply wire harness
    2) Ground wire from the EMI filter
    3) Ground wire from the chassis ground

Tighten the nuts to 15 in/lbs of force.

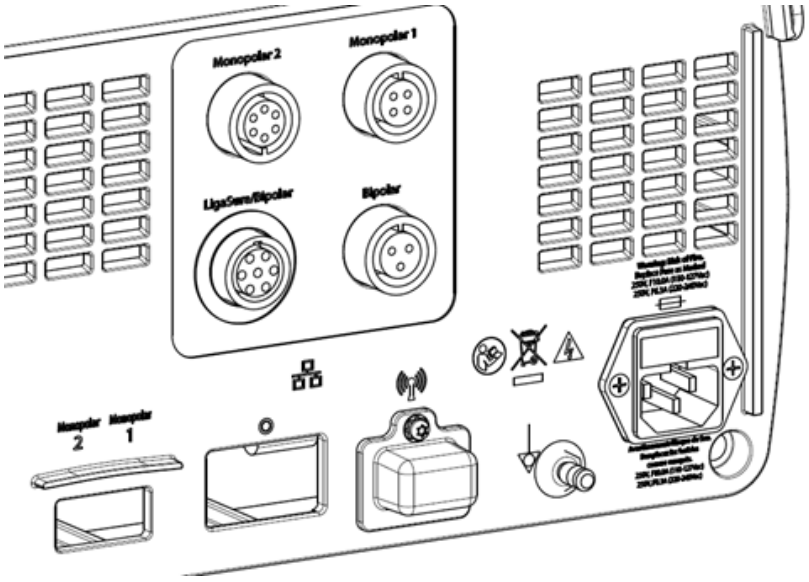
9. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

10. Tighten the bolts to 15 in/lbs of force.



11. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

FTSW PCBA Replacement

Equipment needed

- Torx T-10 driver
- Torx T-30 driver
- 10 mm wrench
- Valleylab Exchange

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.2

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate the 3 ground wire harnesses connecting the rear panel to the top-level assembly and remove the three nuts holding the wire harnesses in place using a 10mm wrench.
4. Locate and remove the Line (brown) and Neutral (blue) wires from the EMI filter.
5. Remove the rear-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
6. Locate the two screws holding the FTSW PCBA to the rear-panel assembly and remove with a T-10 driver. Set the fasteners aside for reinstallation.
7. Remove the FTSW PCBA by holding the edges of the PCBA from the assembly.

Warning

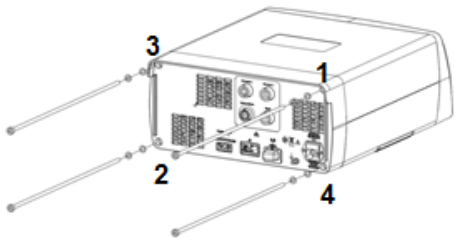
Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

8. Locate and remove the replacement FTSW PCBA from the protective ESD bag handling the PCBA only by the edges of the board.
9. Place the FTSW PCBA into the rear-panel assembly ensuring proper orientation as the PCBA will only go on the rear panel one way.
10. Reinstall and torque the two screws to 5 in/lb.
11. Using a 10mm wrench, replace the ground wires to the equipotential ground connection on the rear panel. The order of placement is:
    1) Ground wire from the power supply wire harness
    2) Ground wire from the EMI filter
    3) Ground wire from the chassis ground

    Tighten the nuts to 15 in/lbs of force.
12. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



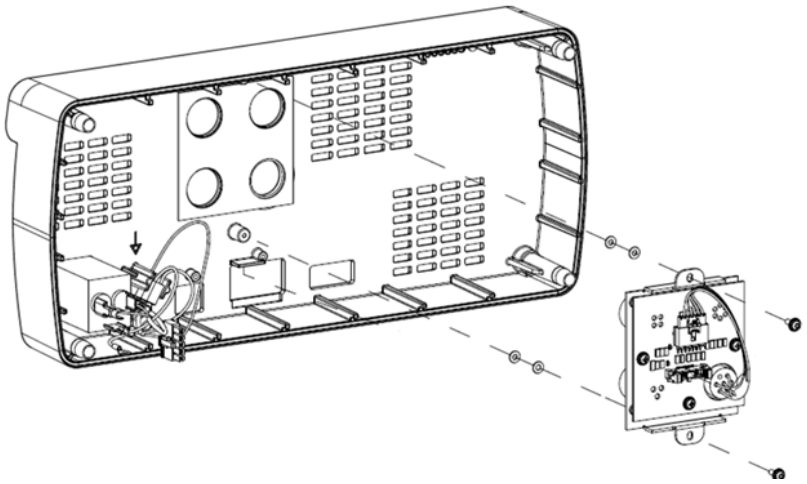
    Bolt-tightening descriptions from the rear view:

    - Top right
    - Bottom left
    - Top left
    - Bottom right

    Tighten the bolts to 15 in./lb. of force.
13. Set up the generator and log into Valleylab Exchange as you would when updating software. See *Software Updates* on page 10-5.

Note: The system will issue an E233 error upon startup of the generator.

14. Valleylab Exchange automatically configures and registers the component.
15. After successful completion of the component setup and registration, the generator will automatically restart.
16. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See v.



Fuse Replacement

Equipment needed

- #1 Flathead screwdriver

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

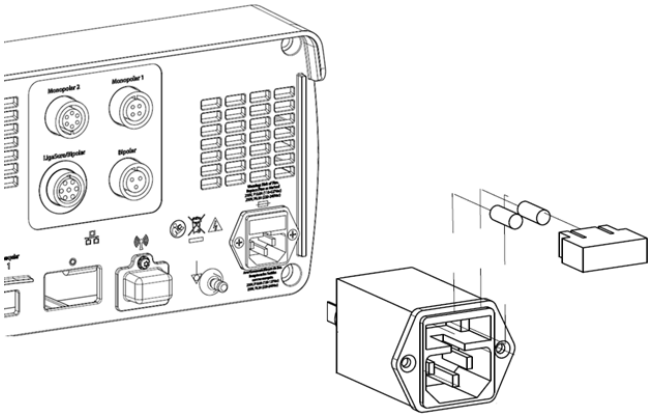
The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.

2. Release the fuse drawer by inserting a small flathead screwdriver into the slot on the drawer above the power cord receptacle. Slide the drawer out.
3. Replace each fuse with one of the same type and rating.
4. Slide the fuse drawer into its slot until it snaps into place.



5. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

WiFi Replacement

Equipment needed

- Torx T-10 driver

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.

2. Using a T-10, locate and remove the single screw holding the WiFi cover to the rear panel assembly. Se the fasteners aside for reinstallation.
3. Locate and remove the WIFI device by holding the edges of the WIFI device and pulling away from the generator.

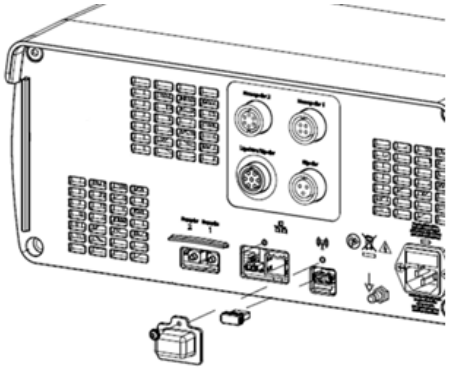
Warning

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

4. Locate and remove the replacement WiFi device from the protective bag.
5. Place the WiFi device into the rear of the generator ensuring proper orientation as the WIFI device will only go into the connector one way.
6. Reinstall and torque the two screws to 5 in/lb.
7. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.



Back Panel Disassembly and Re-assembly

Equipment needed

- Torx T-10 driver

Warning

Electric Shock Hazard To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

Notice

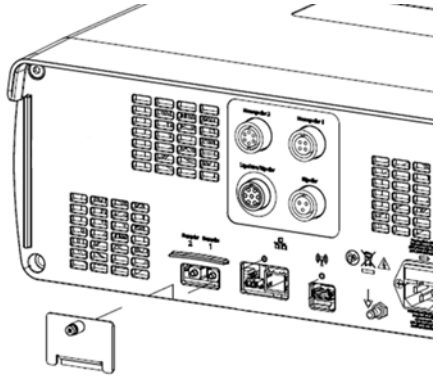
Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

Disassembly

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Using a T-10, locate and remove the single screw holding the back-panel cover to the rear-panel assembly.

Re-assembly

1. Reinstall the back panel and fastener assembly, and torque the screw to 5 in./lb.
2. Upon completion of the PCBA replacement, no calibration is required.



Chapter 10

Maintenance and Repair

This chapter presents the following information:

- The manufacturer's responsibility
- Routine maintenance and safety checks
- Cleaning the energy platform
- Product service
- Service manual copies and updates
- Returning the energy platform for service
- Software updates
- Covidien Technical Service
- Training and education

Precaution

Read the instructions, warnings, and precautions provided with this energy platform and associated accessories before using. Specific instructions for electrosurgical instruments are not included in this manual.

Responsibility of the Manufacturer

Covidien is responsible for the safety, reliability, and performance of the energy platform only if all of the following conditions have been met:

- Installation and setup procedures in this manual are followed.
- Assembly, readjustments, modifications, or repairs are carried out by persons authorized by Covidien.
- The electrical installation of the relevant room complies with local codes and regulatory requirements, such as IEC and BSI.
- The equipment is used in accordance with the Covidien instructions for use.

For warranty information, refer to the *Limited Warranty* section in this manual.

Routine Maintenance and Periodic Safety Checks

Notice

Refer to Chapter 6, *Testing Setup and Functional Tests* for maintenance recommendations and function and output-power verification procedures.

When should the energy platform be checked or serviced?

Covidien recommends that the energy platform be inspected by qualified service personnel at least once a year. This inspection should include adjusting the system to factory specifications.

When should the power cord be checked or replaced?

Check the power cord before each use of the system or at the intervals recommended by your institution. Check the power cord for exposed wires, cracks, frayed edges, or a damaged connector. Replace damaged cords.

When should the fuses be replaced?

An internal component malfunction can damage the fuses. The system fuses may need to be replaced if the system fails the power-on self-test or if the system stops functioning, even though it is receiving power from a wall outlet.

Cleaning

Warning

Shock Hazard Before cleaning or servicing the unit, disconnect the power plug from the power outlet in order to completely isolate the generator from mains power.

Notice

Do not clean the energy platform with abrasive cleaning or disinfectant compounds, solvents, or other materials that could scratch the panels or damage the energy platform.

Do not spray cleaning fluids directly on the generator as damage to the generator may occur.

1. Turn off the system and unplug the power cord from the wall outlet.
2. Thoroughly wipe all surfaces of the energy platform and power cord with a damp cloth and mild cleaning solution or disinfectant. The energy platform will withstand the effects of cleaning over time without degrading the enclosure or display quality.

Product Service

Covidien recommends that all VLFT10GEN systems be returned to the manufacturer for all service requirements. If any service is required without returning the system to the manufacturer, Covidien recommends that only qualified personnel service the VLFT10GEN system.

Covidien defines qualified personnel as a person with electrosurgical equipment repair experience, such as biomedical personnel, and/or individuals who have taken official Covidien training courses.

Returning the Energy Platform for Service

Before returning the energy platform, call a Covidien sales representative for assistance. If the energy platform is to be sent to Covidien, do the following:

1. Obtain a return authorization number.

   Call the Covidien Technical Service Center (see page 10-6) to obtain a Return Authorization Number. Have the following information ready before calling:

   - Hospital/clinic name/customer number
   - Telephone number
   - Department/address, city, state, and zip code
   - Model number
   - Serial number
   - Description of the problem
   - Type of repair to be done

2. Clean the energy platform.

   See the previous section, *Cleaning*.

3. Ship the energy platform.

   a. Attach a tag to the energy platform that includes the return authorization number and the information (hospital, phone number, etc.) listed in step 1.

   b. Be sure the energy platform is completely dry before packing it for shipment. Package it in its original shipping container, if available.

   c. Ship the energy platform, prepaid, to the Covidien Service Center.

Software Updates

Software updates are available directly from Covidien by using the Valleylab Exchange Remote Software System application.

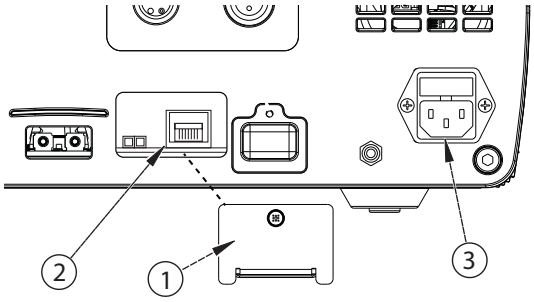
Go to http://www.medtronic.com/covidien/support/valleylab-exchange to download and install the latest version of the Valleylab Exchange application. For additional information, the *Valleylab Exchange Remote Software System User's Guide* is available on the Valleylab Exchange website.

Updating Energy Platform Software

Once the Valleylab Exchange application has been installed on the computer to be used for the update, follow these brief instructions. Refer to the *Valleylab Exchange Remote Software System User's Guide* for more extensive information if needed.

To remotely update software on a VLFT10GEN Energy Platform:

1. Turn on the facility computer that has Valleylab Exchange installed,
2. Remove cover on back of generator to expose the data ports.



① Ethernet receptacle cover

② Ethernet receptacle

③ Power cord receptacle

3. Connect Ethernet cable to the Ethernet receptacle on the back of the energy platform.
4. Connect the other end of the cable to a LAN connector on the facility computer.
5. Plug the system power cord into the power cord receptacle.
6. Plug the other end of the cord into a grounded power receptacle.
7. Turn on the generator by pressing the On/Off button and wait for the power-on self-test to complete.
8. Touch the Service/Settings button on the front panel of the generator to view the *Service and Settings* menu.
9. Touch the **System** button from the menu to view the *System Menu*.
10. Touch **Network**.

11. Select **Enable Network Default Pt. to Pt.**
12. On the facility computer, open the Valleylab Exchange application. Valleylab Exchange prompts the user to put the energy platform in service mode.
13. Start the software update from Valleylab Exchange. See *Software Updates* on page 10-5.
14. Confirm the start of the software upgrade on the generator touchscreen. A progress bar on the generator will inform you that the software update is in process.
15. After the successful completion of the software update, the generator will automatically restart.
16. When Valleylab Exchange indicates the upgrade is complete, turn off the generator by depressing the On/Off button for 3 seconds.
17. Unplug the system power cord from the wall receptacle.
18. Unplug the system power cord from the rear panel receptacle.
19. Disconnect the Ethernet cable from the facility's LAN connector.
20. Disconnect the Ethernet cable from the back of the generator.
21. Replace cover on back of generator to cover the data ports.

Service Manual Copies and Updates

The latest version of this service manual is available at http://www.medtronic.com/covidien/support/biomed-connect/electrosurgery.

To request a hard copy of the service manual, call the telephone numbers listed in the next section.

Covidien Technical Service

For service, contact Covidien Technical Service or your VLFT10GEN sales representative. Contact a Covidien technical-service representative by telephone, email, or through the Internet:

- USA and Canada: 1 800 5 8522 Option 2
- International: 1 303 476 7996
- Email— valleylab.technicalservice@covidien.com
- Internet—http://www.medtronic.com/covidien/support/service-centers

  or

  http://www.medtronic.com/covidien/support/biomed-connect/electrosurgery

Training/Education

For clinical professionals and service training options, please refer to the Covidien web site: http://www.covidien.com/education.

Rx ONLY

Consult instructions for use

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Part No. PT00047922

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